AVIATION WEEK

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A YEAR

How they measure "Panther-Juice"

The Grumman F9F "Panther"—the first jet-powered carrier plane to strike at an enemy—is one of 10 types of jet aircraft now measuring fuel by the Honeywell Electronic Fuel Indicating System.

This photograph shows how the F9F's wingtip fuel tanks are refilled—using a long hose and portable ladder, since the wings fold up on shipboard.

And millions of air-miles show how *dependably accurate* the Honeywell system is—how much *more* accurate than systems that measure by volume instead of by weight.

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Honeywell
Aeronautical Controls

America's first Jet Transport

viceability... low maintenance

More time in the air, less time on the ground is one of the secrets of profitable airline operation. With this in mind, the designers and builders of the AVRO Jetliner have incorporated maintenance and servicing advantages that will assist ground crews. Engines can be serviced from the ground, inspection doors are within arm's reach and underwing pressure refueling is standard equipment.

In the air, the Jetliner is reducing flight time between cities. Those fortunate few who have flown in the Jetliner are proudly sharing their experience of smooth and comfortable flight with eager listeners. With greater carrying capacity, and the prospect of more flying hours per day, Jetliner performance promises a new high in serviceability. Studies of Jetliner serviceability and operation are available to interested operators.

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Research keeps

1870 BFG B.F.Goodrich

FIRST IN RUBBER

Bicycle helps a bomber trim its weight

SHAVING pounds off the Boeing B-47 bicycle-type landing gear helped the bomber reach its trim fighting weight. The bicycle gear uses the new design B. F. Goodrich wheel and brake—lightest for its capacity yet developed.

The simple design of the Expander Tube brake itself means that the brake can be made lighter for a given amount of kinetic energy than any other brake. And still more pounds have been trimmed off by new weight-saving features.

The new B. F. Goodrich expander tube has a narrow cavity that operates with greater pressure and less fluid displacement. The new spider-type frame is both lighter and stronger. A new kind of brake block permits the use of *thinner* blocks—with longer wear and increased economy. A new torque bar design feature also saves weight.

The wheels are light, strong magnesium castings. Tires are B. F. Goodrich extra high pressure, built to take 240 psi inflation.

Besides its light weight, the B. F. Goodrich assembly also offers lower maintenance cost—through less in-shop time, fewer replacements and longer life. Pilots like the operational "feel", too. The brakes cannot lock or grab. They respond smoothly over the whole pressure range. They take heavy overloads better in emergencies.

Today's trend is to B. F. Goodrich assemblies. They have special advantages for airliners and personal planes as well as military aircraft. Get full information from BFG engineers by writing to *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

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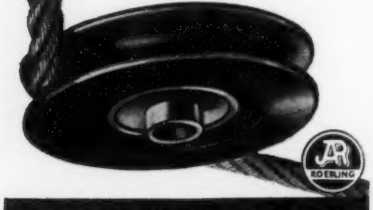
ENGINEERING SERVICE

Contact our Engineering Dept. for full data and suggestions on complete Lock-Clad Control Cable Assemblies. John A. Roebling's Sons Company, Trenton 2, New Jersey.



ROEBLING

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Aviation Week

ABP Member ABC

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FOR THE AVIATION INDUSTRY

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

NEWS DIGEST

DOMESTIC

Seibel Helicopter Co., Wichita, has been awarded an Air Force test order for tactical evaluation of its S-4A helicopter. The machine will be designated YH-24 and will be delivered immediately upon completion of contract negotiations. USAF is buying the commercial version, which has been in production for several months.

Edward M. Sturhahn, long-time official of CAA, has resigned. Recently he was director of CAA's project to build another airport at Washington, D. C., and before that was executive assistant to the Administrator. His successor will be Herbert Howell, who has been airports regional director for CAA at Kansas City.

TWA expects to add to speed and payload of its Model 749 and 749A Constellations with new jet exhaust kits developed by Lockheed Aircraft Corp. Exhaust collector rings will have ten instead of two stacks. The carrier, which will make the installation at Kansas City, predicts an additional eleven mph. at operational altitudes and 140 to 200 mi. additional range at same payload, or 800 to 1500 lb. more payload at same range.

New altitude record for lightplanes, claimed by former Wasp pilot Caro Bayley, was highlight of the Miami, Fla., air show. Miss Bayley, who weighs just 100 lb., flew a 125-hp. Piper Super Cub to 30,380 ft., nearly 6000 ft. higher than the former record established by Anna Luise Branger, of the Venezuelan embassy, Washington, D. C.

James Forrestal Research Center for jet propulsion and related sciences will begin operation at Princeton University within a few months. Faculty for the Center will come from Princeton's aeronautical, chemical and mechanical engineering and mathematics and physics departments.

Bert C. Goss, Washington vice president of Hill & Knowlton, Inc., in charge of public relations for the Aircraft Industries Assn., will move to New York Feb. 1. Succeeding him in Washington in the AIA job will be Avery McBee, now an H&K vice president in New York. Goss has directed AIA public relations since reorganization of the Aeronautical Chamber of Commerce in 1944. McBee, wartime public relations director of the Glenn L. Martin Co., formerly represented N. W. Ayer & Sons, Inc., in Honolulu.

Gordon M. Bain has been appointed head of CAB's new Bureau of Air Operations. This bureau replaces the old Bureau of Economic Regulation, and enlarges its scope. Bain takes over primary responsibility for economic operating activities. Before this appointment, he was executive officer of CAA's sixth region, based at San Francisco.

Aircraft shipments for October came to 3,507,700 lb. airframe weight. The military got 91 percent of this. Civil plane shipments came to 195, worth $5.1 million. Engine horsepower shipped totaled 5,089,900, with 98 percent going to the military.

Fairchild C-119 Packet lines halted at the company's Hagerstown plant as a result of a strike by production workers. At issue were the size of a raise—CIO United Auto Workers Union asked 15 cents an hour, company offered 12—and Fairchild's merit raise system. The system provides for rating employes' proficiency four times a year to give the basis of raises. Union wants automatic raises based on seniority.

FINANCIAL

North American Aviation reports net income of $8,086,255 after taxes for fiscal 1950, ended Sept. 30. Sales and other income came to $143,268,418. Net income was $7,306,409 for the previous fiscal year. Unfilled orders are given as $311,844,812 as of Sept. 30.

National Airlines has voted to pay a 25-cent dividend on its one million shares of outstanding stock, the first cash dividend in the company's 16-year history. It will be payable Jan. 25 to holders of record Jan. 15. National showed a profit of $558,270 for the fiscal year ended last July 31 and reported earnings after provision for taxes and depreciation of $463,426 for the five months ended Nov. 30.

INTERNATIONAL

British aircraft industry's exports for November 1950, were $7,564,432 as against monthly average of $8,282,400 for 12 previous months. November '50 exports included $1,988,781 for 57 complete aircraft, $1,451,740 for 152 engines, $70,702 for 1752 tires, and $4,052,207 for accessories. Total was offset by $2,851,136 of imports, including $639,198 for 4 aircraft and $2,221,936 for accessories.

Bristol Aeroplane Co. will go into production of the de Havilland Venom to supplement DH's own production, the Ministry of Supply announced.

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LOS ANGELES, CALIFORNIA • DALLAS, TEXAS • OTTAWA, CANADA

AVIATION CALENDAR

Jan. 9-26—Third annual Institute of Industrial Transportation and Traffic, Washington, D. C.

Jan. 15-18—Plant maintenance show and concurrent conference on plant maintenance techniques, Cleveland, Ohio.

Jan. 20-21—First soaring contest of the Northern California Soaring Assn., Warm Springs Airport. Write Emil Kissel, contest committee, Warm Springs Airport, Warm Springs, Calif.

Jan. 21—Air education day, sponsored by the Palm Springs Junior Chamber of Commerce, Palm Springs Airport, Calif.

Jan. 22-26—Winter general meeting, American Institute of Electrical Engineers, Hotel Statler, New York.

Jan. 29-Feb. 1—19th annual meeting of the Institute of Aeronautical Sciences, Hotel Astor, N. Y.

Feb. 1-2—Annual spring management conference, sponsored by the Society for Advancement of Management and Northwestern University Centennial Committee, Chicago Campus, Northwestern University, Chicago.

Feb. 7-8—Third annual aircraft spraying and dusting short course, University of Minnesota, St. Paul, Minn.

Feb. 19-20—Meeting covering agricultural research as related to aviation, sponsored by the Flying Farmers of America, Memphis.

Feb. 23—Air Transport Command five-year reunion, Waldorf Astoria Hotel, New York. For information write: E. K. Hastings, resident manager of the hotel.

Mar. 12-13—Short course on uses of aerial equipment in agriculture. Purdue University, West Lafayette, Ind.

Mar. 16—Sixth annual flight propulsion meeting. Institute of Aeronautical Sciences, Hotel Carter, Cleveland.

Mar. 19-23—Seventh Western Metal Exposition, Oakland Auditorium and Exposition Hall, Oakland, Calif.

Apr. 24-26—ATA annual engineering and maintenance conference, Hotel Drake, Chicago.

May 12-13—Airlines Medical Directors Assn. eighth annual meeting, Hotel Shirley Savoy, Denver, Colo.

May 13-14—Airline Medical Examiners Assn. fourth annual meeting, Hotel Shirley Savoy, Denver, Colo.

May 14-16—Aero Medical Assn. 22d annual meeting, Hotel Shirley Savoy, Denver, Colo.

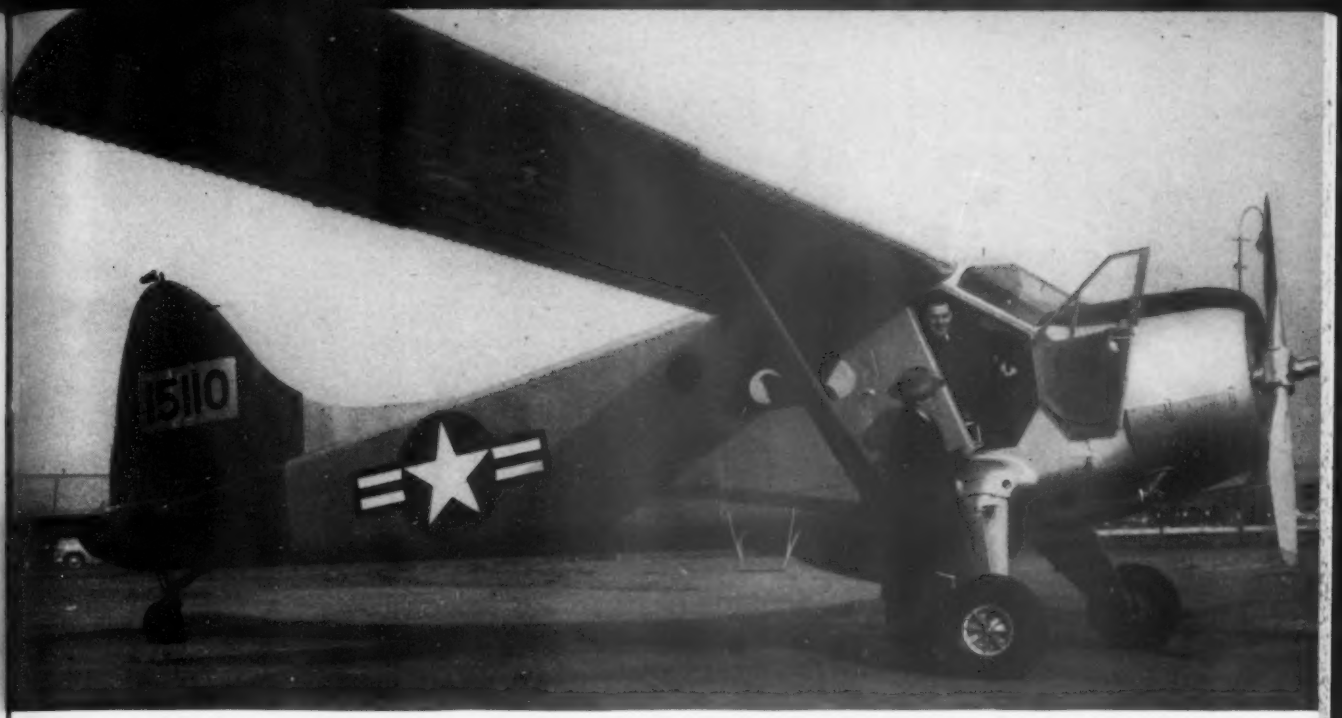
May 17-19—Annual convention of the Women's Aeronautical Assn. of the U. S., Little Rock, Ark.

June 11-15—Second annual conference on industrial research, conducted by Columbia University Dept. of Industrial Engineering, New York.

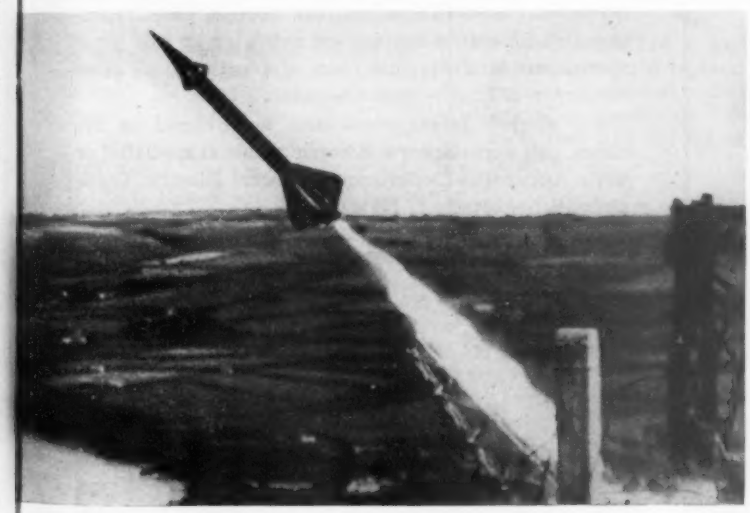
June 15-July 1—International aviation display, Grand Palais and Le Bourget Airport, Paris.

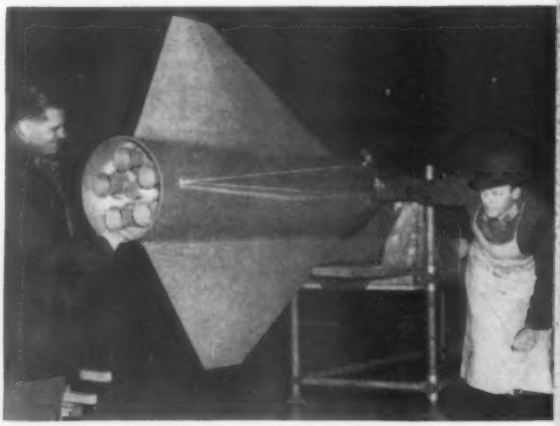
PICTURE CREDITS

9—(center) Combine, (bottom) Piaseckl; 13—North American Aviation; 14, 15—Republic; 17—Dept. of Defense; 29—NACA; 39—AiResearch; 55—CAA.



DH BEAVER JOINS USAF—Fully bedecked with USAF insignia, including Arctic-red tail and wing markings, first DH Canada C-127 Beaver waits at the factory for delivery to U. S. officials. Note winter nose cowl. The belly tank gives C-127 a range of 910 mi.

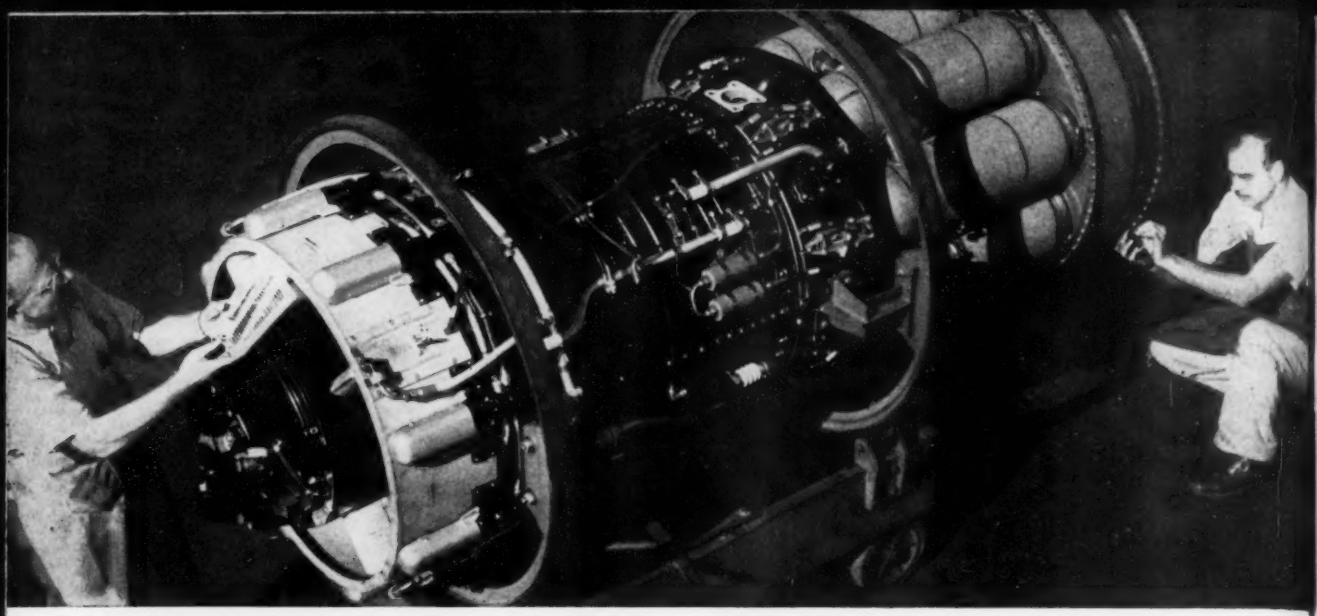




BRITISH ROCKET TRIAL—A 20-ft. long, 17-in. diameter research missile leaves inclined platform (left) in Britain. View above shows rocket exit nozzles.

News Picture Highlights

HUP-1 ENTERS SERVICE—First production Piasecki HUP-1 utility copter to enter operational service leaves Morton, Pa., for Lakehurst, N. J., for use in pilot familiarization program before joining a Navy vessel. Powered by a 525-hp. Continental, the all-metal HUP-1 can do over 130 mph., seats five plus a crew of two. The inclined vertical stabilizers are a recent addition.



Latest production model of G-E J47 to be installed in USAF planes is J47-23. Unaugmented, it packs more power into the standard J47 frame size. Air Force has not yet released thrust but has indicated it is in excess of 5200 pounds. Anti-icing, opposite polarity ignition, and a new compressor having higher efficiency, greater airflow, are main features of -23.

IN THE NEWS

NEW ENGINE
NEW TURBO
NEW LAB

As specialists in every type of aircraft gas turbine, General Electric offers you a complete line of powerful propulsion units. Turbojets, turboprops, turbosuperchargers for piston engines are available to suit your specific needs. Forty-five years of experience are your assurance of quality and dependability.

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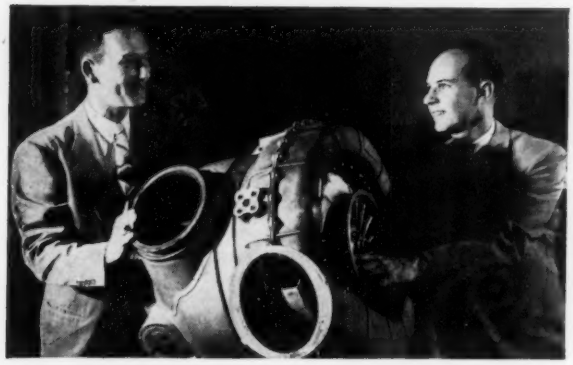
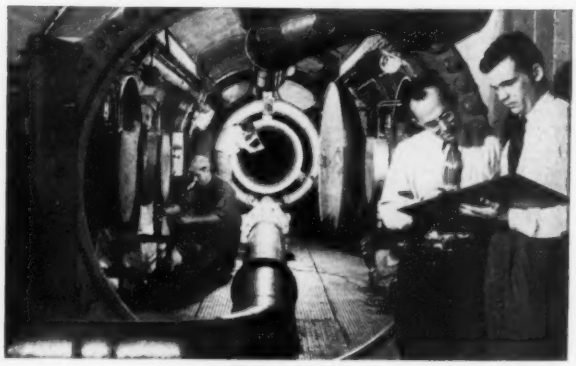


New turbosupercharger promises longer ranges, heavier payloads to today's transport aircraft through greater power, lower fuel consumption, and greater simplicity. Now on test with Pratt and Whitney R-4360-C engine, it can be adapted to any engine of similar size.



Full scale compressor test stand in new Aircraft Gas Turbine Laboratory at Lynn, Mass. can run tests simulating altitudes up to 70,000 feet, temperatures to ±100F. The lab, newly opened, is dedicated to memory of Dr. Sanford Moss, early pioneer in aviation.

AIRCRAFT GAS TURBINES

GENERAL ELECTRIC

210-20

WHO'S WHERE

In the Front Office

L. G. (Larry) Fritz, American Airlines' vice president-operations is back at his desk after a three-months leave of absence due to illness. **T. L. (Tommy) Boyd,** who had served as general director of operations for the system while Fritz was out, has been named operations manager.

Thomas M. Miller has been elected vice president of traffic and **W. Thomas Beebe** vice president-personnel for Chicago & Southern Air Lines. Miller was formerly general traffic and sales manager and Beebe was personnel director.

Paul J. Frizzell has been named a vice president of Fairchild Aircraft to be in charge of operations in the assistance agreement between the company and Kaiser-Frazer covering stepped up output of the C-119 Packet. During World War II Frizzell was assistant general manager of the Fairchild Aircraft division and one of those primarily connected with the firm's industrial mobilization studies on the C-82 and C-119.

E. M. Eickman has been appointed to the new post of assistant manager of Goodyear Tire & Rubber Co.'s Aviation Products division.

John Leslie, Pan American World Airways' vice president, has returned to his desk after being out about six months due to illness.

Changes

H. Erich Nietsch has joined Robinson Aviation, Inc., Teterboro, N. J., as assistant to the president. He will work in a liaison capacity between the sales and engineering departments. . . . **Vernon Rawlings** has been named factory manager for Glenn L. Martin, replacing **N. F. Vanderlipp,** who resigned Jan. 15.

John W. Belanger and **Nicholas M. DuChemin** have been named general managers of General Electric's Large Apparatus and Small Apparatus divisions, respectively. . . . **Willard L. Landers** has been appointed general manager of Fairchild's Aircraft division. . . . **Richard Hay** has been named purchasing agent for Airwork Corp., Millville, N. J. . . . **Fred S. Hage, Jr.,** has been named by Solar Aircraft Co. as head of its Dayton office.

Donald L. Urquhart has been named manager of agencies for American Airlines, succeeding **Herman Theilig** who resigned to join a travel agency in an executive capacity. . . . **Capt. Samuel H. Miller** has been made acting operations manager for Pan American World Airways' Atlantic division.

Honors and Elections

New officers elected by the Airline Finance and Accounting Conference for 1951 include: **C. H. Blanchar** (UAL), president; **C. G. Adams** (Braniff), first vice president, and **R. G. Lochiel** (Capital) second vice president.

INDUSTRY OBSERVER

►Electronics and aircraft manufacturers have been handed a packaged requirements assignment by the USAF to produce a fully automatic sonic speed interceptor which will carry a pilot monitor and an air-to-air missile, designed to knock down an enemy bomber at 60,000 ft. altitude. Hughes Aircraft has won the competition for the electronic guidance. The airplane competition is as yet undecided, with several of the major companies competing.

►Navy orders for Douglas A2D turbojet attack fighters are expected to be in such quantities as to absorb most of the production of both the Allison T-40 and the Pratt & Whitney T-34 turboprop engines for the next two years.

►French Air Force is expected to replace its de Havilland Vampires, now in use, with the French-built Marcel Dassault 450 Ouragan interceptor soon to go into service. First production Ouragan flew last November. A sweptwing version, the 452 Mystere is being readied for first flight at Istres. Ouragan jet craft is powered with the British Rolls-Royce Nene turbojet.

►Goodyear Aircraft is conducting a flight test program with its GA-22 four-place amphibian (AVIATION WEEK Nov. 6) to demonstrate that it will pass all CAA requirements for certification. As soon as this is completed about Mar. 1, the prototype is expected to make additional demonstrations for the Department of Defense of its capabilities for liaison and ambulance work. Goodyear is tooled for immediate limited production of the plane if defense orders are forthcoming.

►Avro Canada Ltd. is conducting a series of anti-icing and pressurization tests on the Avro Jetliner. It expects the first pre-production model of the twin-jet CF-100 night fighter, powered with Avro-built Orenda turbojets, to be flying soon. The two prototype CF-100s have already made more than 150 test flights. Assembly line for the night fighter is now being set-up.

►Use of virtually standard turbojet aircraft engines to power some of the guided missiles now being readied for production means that some of the engine manufacturers are assured a firm market for their products no matter how fast the pendulum swings from aircraft to missiles for defense. Best example is the Allison J-33 engine which powers the Martin Matador.

►Lightplane manufacturers who are still producing civilian planes, principally Cessna, Piper, Beech and Ryan, are experiencing a belated demand from consumers, such as hasn't been seen since the private flying boom days of 1946. And if delays in deliveries of parts and components hadn't slowed assembly lines, the 1950 plane deliveries might have been considerably higher than the 3400 aircraft at which they are leveling out.

►Cessna Aircraft plans for after the war emergency feature a new model two-seater. It will take the place of the popular Model 140, being discontinued Feb. 15. Cessna has a contract for approximately 1000 L-19 liaison planes for Air Force and Army use. It also is constructing parts for the Boeing B-47 and Lockheed F-94, and continues limited production of its four- and five-place civilian models.

►Interesting byproduct of the development of big cargo transports such as the Douglas C-124A Globemaster II has been the design of new tie-down fittings with rated strengths as high as 50,000 lb., to hold heavy vehicles and machinery. New methods of lashing vehicles in place for air transportation make it possible to provide restraint for a 3.2G upload, or 1.5G forward, aft, or to one side, even for a single large 50,000-lb. vehicle or package.

Washington Roundup

Abolish CAB?

The Civil Aeronautics Board may have to fight for its life in this session of Congress.

Edward Jelsma, staff director of the Subcommittee on Domestic Surface Transportation of the Senate Interstate and Foreign Commerce Committee, is now drafting legislation rewriting the 1940 Transportation Act. It will be introduced by the committee's chairman, Sen. Edwin Johnson, and likely will propose a national transportation commission. This would absorb Interstate Commerce Commission and take over maritime and air economic regulatory functions.

It will also probably make these proposals affecting aviation:

• **Maximum and minimum rates,** instead of fixed rates. The maximum would protect shippers and passengers from monopolistic overcharge; the minimum would prevent the "freezing out" of competition. Within the range, competition would work.

• **Control of all subsidies,** direct and indirect, by the Under Secretary of Commerce for Transportation. He would pass on appropriations for airways facilities, as well as support to the airlines.

• **Certificates of "necessity and convenience"** issued by the new NTC would take into account all types of service available to a community—bus, automobile, truck, rail, airline.

New CAB Member?

Senators mark down Seattle attorney Joseph Adams, former Director of Aeronautics for Washington state, as the new CAB member. He's the candidate of Sen. Warren Magnuson, has general western backing. Fortyish, Adams commanded a Marine air wing at Okinawa in the last war, holds the rank of colonel.

Sen. Harley Kilgore won't fight the appointment, although Kilgore pushed for reappointment of Russell Adams, now an assistant to the Secretary of State. At the time, he charged PanAm officials wanted to "kill off" Russell Adams for his opposition to the PAA-American Overseas merger.

Congressional circles, though, don't ascribe Russell Adams shift to PAA, but rather to the President's decision to open the way for Joseph Adams. Magnuson had previously recommended Joseph Adams' appointment and been turned down when Truman selected Joseph O'Connell for appointment, instead. Adams' designation would also give the Far West more representation on the Board. Several western senators are pressuring for this.

Air Cargo: USAF Stepchild

As it was in the last war, it is apparently going to be in this emergency. USAF's Senior Officers Board has canceled out of its development program a plane designed for MATS operations and feasible for commercial operation to increase airlift in being. This, despite MATS' commander, Maj. Gen. Laurence Kuter's urgings for such a plane, and congressional apprehension over lack of air capacity to carry on war thousands of miles from our shorelines.

Chief of Staff Gen. Hoyt Vandenberg classed a build up of airlift as "desirable—not essential."

War Peak Capacity

Capacity for 50,000 planes a year, asked by President Truman, will actually mean an industrial base approximating that of the peak war year, 1944, when 96,000 aircraft rolled off production lines. This base will produce less planes now because four times the effort of six years ago goes into today's heavier, more complicated craft. The weight of 96,000 planes in 1944 was 963 million lb.; 50,000 now would weigh about 650 million lb.

New Renegotiation Law

A new renegotiation law will be one of the first orders of business of the House Ways and Means Committee. The prospect: Renegotiation coverage will be expanded to virtually all government contracts. This would mean coverage, for the first time, for National Advisory Committee for Aeronautics' contracts and contracts of the Civil Aeronautics Administration. Present law, a rider on the 1951 fiscal year military budget, applies only to Department of Defense contracts.

International Air Subsidies

Sen. Edwin Johnson, chairman of the Senate Interstate and Foreign Commerce Committee, is concerned that separation of service mail pay from government support on U. S. companies' international routes may bring cries of "unfair government-subsidized competition" from foreign carriers.

But the Senate has directed his committee to work out a plan for separation over international, as well as domestic, routes. He plans to introduce legislation accomplishing this shortly.

Here and There

• **Contract negotiators.** A shortage of trained negotiators in USAF and Naval Air is holding back contract letting.

• **Air Academy.** Air Force still wants it, but the general congressional sentiment is that in a national emergency it falls into the class of luxury and can be deferred.

• **Civil defense.** Air Coordinating Committee's chairman, Delos Rentzel, and Civil Defense Administrator Millard Caldwell are working out air organization for civil defense. There are some 90,000 non-airline planes that might furnish vital lift. National Association of State Aviation Officials has set the wheels rolling for mobilization at the state level and down the "grass roots," supplying its membership with a model organizational plan.

• **Air Engineering Development Center.** The high altitude engine test chamber, constructed from captured German equipment, will be ready early in 1952; the hypersonic windtunnel, by late 1953; the supersonic propulsion windtunnel, by early 1954.

• **Tactical air.** Rep. Walter Norblad is prodding Chairman Carl Vinson to open hearings before the House Armed Services Committee. He wants tactical air transferred from USAF to the Army. Vinson wants the services to work the matter out themselves—without public fanfare.

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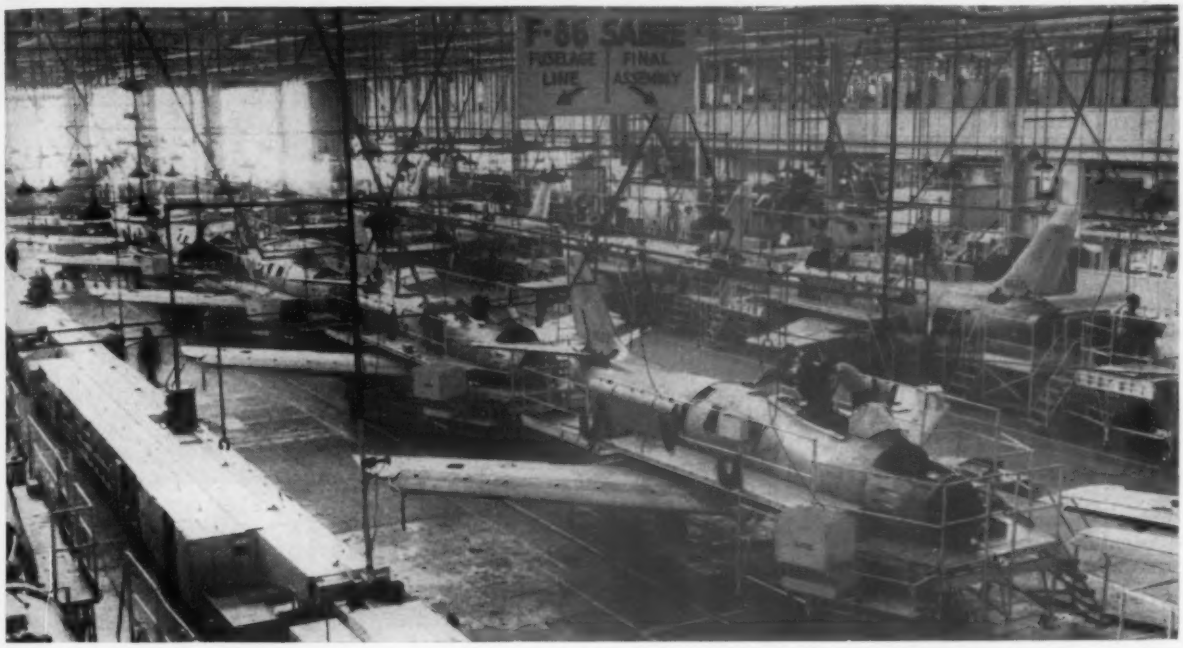


F-86E CONTRACTS placed by USAF are expected to keep this North American production line rolling for a long time to come.

Orders Roll: AF Issues $4.5 Billion Worth

Eight air frame, four engine, two propeller companies get bulk of fiscal 1951 business.

By Aviation Week's Washington Staff

The USAF procurement logjam is broken wide open.

Top Pentagon sources have told AVIATION WEEK that virtually the entire $6.68 billion so far appropriated for fiscal year 1951 hard goods procurement has been committed in letters of intent as of Jan. 5.

Actual contracts have been issued obligating $4.5 billion of this total.

Dynamiting of the Air Force procurement block came at an all-night session of the Senior Officers Board, immediately following the enactment of the second supplemental for the 1951 basic appropriation (AVIATION WEEK Jan. 8).

Brig. Gen. Horace A. Shepard, Assistant to Deputy Chief of Staff, USAF, Materiel, was promptly dispatched to AMC headquarters, Wright-Patterson AFB, Dayton, O., with the program of commitment and obligation. The actual paper work of the program was handled there.

Indications are that additional supplemental appropriations within the next two months will be tacked on by Congress to the program as it now stands. This is a means of making the funds immediately available. If the forthcoming appropriations were for the fiscal 1952 year they would not be available until July 1, 1951.

Eight airframe manufacturers share the bulk of the airplane contracts. Three engine companies divide the major engine contracts, with a fourth coming in for a lesser share.

Here are the airplane companies and the products they are expected to supply to USAF:

- **Boeing Airplane Co.**, B-47B, B-47C and B-50D bombers and C-97 transports.
- **Douglas Aircraft Co.**, C-124 and C-118B transports.

USAF 1951 Procurement Status

Status of USAF fiscal 1951 funds committed and obligated by Air Materiel Command as of Jan. 5 is shown in table prepared especially for AVIATION WEEK.

Major Category	Amount Committed	Amount Obligated
Aircraft and related procurement	$4,945,919,888	$3,609,728,761
Major procurement other than aircraft	612,462,394	293,143,961
Maintenance and operation	984,568,594	551,847,054
Research and development	139,095,534	73,543,132
Total	$6,682,046,410	$4,528,262,908

Committed funds are those that have been assigned to a specific procurement. Funds are obligated when a contractual document is issued.

• **Lockheed Aircraft Corp.,** F-94C fighter, T-33 trainer, and C-121C transport.
• **North American Aviation,** F-86E fighter, T-28 trainer.
• **Northrop Aircraft,** F-89 night fighter.
• **Republic Aviation,** F-84E and F fighters.
• **Consolidated Vultee,** B-36F bomber and T-29 trainer.
• **Fairchild Aircraft,** C-119B transport.

Here are the engine companies and the principal powerplants they are expected to supply:

• **Pratt & Whitney Aircraft,** R-4360 Wasp Major, the R-2800, and the J-48 jet engine.
• **Allison division,** General Motors Corp., J-33 and J-35 jet engines.
• **General Electric Corp.,** J-47 jet engine.
• **Curtiss-Wright Corp.,** R-1300 and R-3350 piston engines, and possibly the Sapphire jet engine.

Curtiss-Wright Corp. and Aeroproducts division of General Motors divide the bulk of the Air Force propeller business, it is indicated.

▶ **Avionics**—The vast amount of expenditure going for electronic, electric and radio equipment is shown by the long list of principal Air Force contractors who fall in this category: Sperry Corp., Lear, Inc.; Minneapolis-Honeywell; Bendix Aviation; Hughes Aircraft; RCA; Philco; Western Electric; General Electric; Emerson Electric; General Mills; Collins Radio; Raytheon and Radioplane.

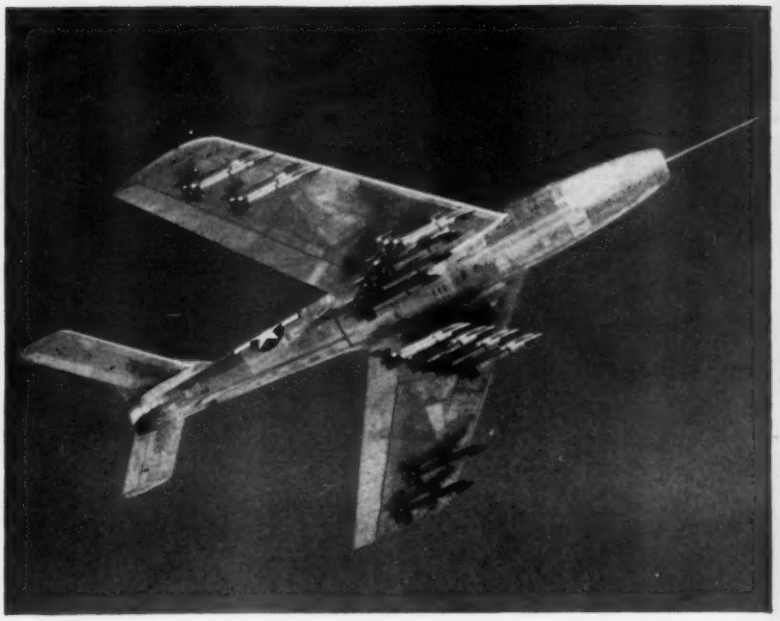
Other miscellaneous principal contractors are: A. C. Sparkplug, Eastman Kodak and A. O. Smith Corp.

▶ **50,000 Planes**—Air Force Undersecretary John A. McCone last week said that the Air Force commitments at AMC headquarters beat, by only a few days, President Truman's message calling for procurement to expand the U. S. aircraft industry to a capacity of 50,000 military planes a year.

Soon after, McCone indicated that the additional capacity will be distributed so as to actually produce about 2000 planes a month by mid-1952. But, McCone said, the program calls for plants to be operating and tooled up so that by opening standby assembly lines and putting workers on an around-the-clock schedule the output can, almost immediately, be virtually doubled in an emergency.

President Truman cited comparative costs of B-36 bombers with B-17 Flying Fortresses of World War II, as $3.5 million each for the B-36s as against a price of $275 thousand each for the B-17s.

McCone declared that President Truman's previous goal of a five-fold aircraft production expansion in a year was not unrealistic and could be reached easily.

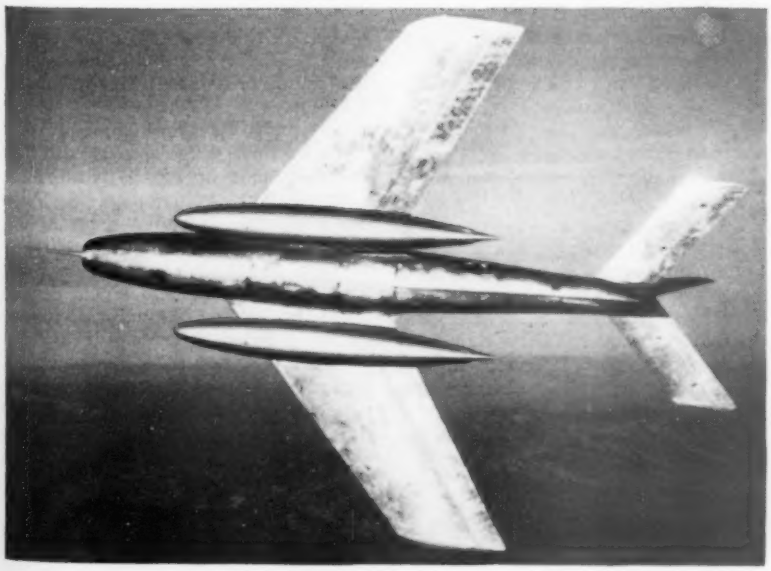


Long-Range F-84F Strikes With Guns, Bombs, Rockets

Latest version of the Thunderjet, Republic's sweptwing F-84F, will bring greater speed and firepower to the plane's fighter-bomber role. No specific data of the F's potential are yet available. But following the Phase Two flight tests recently completed at Edwards AFB, Muroc, Calif., word went out that the sweptwing F far out-performed its predecessor, the E, in every category.

This information is significant in that the E's reported speed is 630 mph., its armament encompassing such loads as 32 5-in. rockets or 2 1200-lb. Tiny Tims plus 12 5-in. rockets.

The accompanying photos show some of the toting schemes of the sweptwing F-84F, in addition to the plane's fixed armament of 6 50-cal. guns. A bristling load of 24 5-in. rockets is seen in photo above. Shown below is a combination of 18 rockets and 2 1000-lb. bombs. Two 230-gal. external fuel tanks can be carried on the pylons instead of the bombs. Top photo, opposite page, depicts the F hurtling in behind its ripple fire of 5-inchers. At bottom on opposite page is the F as an escort fighter carrying 2 450-gal. tanks under the roots, to give it a radius of action exceeding that of its predecessor. Figure for the E with four external tanks (two under tips, two on bomb pylons) was about 1000 mi. Report is that the F has been ordered in large quantities. It is likely that the production version will have a modified fuselage.



Nation's Industries Share Air Contracts

Mobilization of major segments of the automotive industry along with several smaller industries continues to make news this week as the Air Force and Navy move to augment the nation's aircraft production potential.

• **Chrysler Corp.,** Detroit. Negotiations are underway between Pratt & Whitney Aircraft div. of United Aircraft Corp. and the Chrysler Corp. for license to manufacture J-48 Turbo-Wasp jet engines at Detroit. Chrysler will build a new plant near that city for manufacture of the 6250-lb.-thrust J-48.

• **Servel, Inc.,** Evansville, Ind. Under terms of a preliminary letter of intent contract agreement between Republic Aviation Corp. and Servel, the gas refrigeration company will build F-84 Thunderjet fighter wings. During World War II Servel built parts, including aircraft gun turret sub-assemblies and airplane engine cylinder heads. Peak employment reached during World War II was 10,500.

• **General Electric.** USAF has entered negotiations with GE for manufacture of aircraft superchargers at the old Allis-Chalmers supercharger plant at West Allis, Wis. The plant is now occupied by Hotpoint Manufacturing Co., a GE subsidiary manufacturing dishwashers.

• **Bell Aircraft.** Bell will build B-36 and B-47 jet engine "packaged" nacelles for Convair and Boeing at the Bell-leased Globe Aircraft plant in Fort Worth. The 78,000-sq. ft. plant occupies 155 acres. Bell will occupy the plant as soon as General Services Administration can remove stored equipment. The plant is under Navy cognizance.

• **Lockheed Aircraft Corp.** Air Force this week confirmed an earlier AVIATION WEEK story that Lockheed would occupy a portion of the former Bell Marietta, Ga., plant for modification of B-29 aircraft. Major portion of the facility will be held for production of an "as yet unnamed heavy bomber." This means decision as to successor of present B-36 has not been reached. Air Force at present is still considering a sweptwing proposal of the B-36 against a heavier version of the Boeing B-47. Boeing's heavy bomber contender is the B-52 scheduled for roll-out late this year.

• **General Motors.** GMC this week confirmed an earlier story (AVIATION WEEK Dec. 25) that it would build the Republic F-84F under license at its Kansas City facility. GMC announced Edward D. Rollert as manager of its aircraft program at Kansas City and said that its management group would set up headquarters there Feb. 1.

Lightplane Year

1950 closes strong but producers worry about priorities situation.

Cessna Aircraft Co. took leadership in 1950 lightplane production by a slight margin over Piper Aircraft, first returns for the two companies showed last week.

Incomplete returns for all companies, received by Aircraft Industries Assn. last week, showed 1950 shipments of 3425 planes, with manufacturers' value of more than $18.5 million. This is substantially ahead of 1949 sales of 3362 planes valued at $14,324,000.

Cessna shipped 1134 planes and Piper 1108, so that the two companies together produced approximately two-thirds of all the planes shipped.

Joseph T. Geuting, Jr., AIA Personal Aircraft Council manager, points out that in addition to the civilian production, virtually all the personal aircraft manufacturers are already working on subcontracts for military planes. Some are producing liaison planes and conducting modification programs on other military planes.

The sharp increase in dollar volume for 1950 reflects the trend toward larger and more expensive planes for executive travel and business uses. The increase was seen as a definite turning point in the postwar history of the lightplane companies which had watched sales drop each year since the boom year of 1946.

Sales in the last quarter of 1950 mounted each month, in contrast to the usual seasonal winter decline in small plane sales. This was attributed in part to the increased business use of the planes and probably also in large measure to the increased demand created by anticipated shortages in plane supplies in 1951.

▶ **Priorities Needs—CAA** is expected to make a presentation to the National Production Authority next week on what priorities should be allotted for smaller aircraft. It is not expected that forthcoming priorities will be sufficient to produce at a rate of more than approximately 3000 planes a year, perhaps considerably less.

Representations of CAA on the need for priorities will be based primarily on the uses of the planes by industry—a recent CAA study shows that a total of 48,010 planes are now being used by industries other than aviation. Use of the planes in agriculture for spraying, dusting, seeding, and fertilizing, and hauling farm produce and equipment, is important. CAA records show that 10,500 planes are operated by farmers and ranchers. Also to be emphasized will be the need for continuation of training programs and planes to provide a continuing reservoir of young pilots to supplement the aging World War II pilot reserve.

A study recently made by AIA showed that the materials needed by the personal plane companies to produce on the 1949 level of approximately 3300 planes was so small as to be almost negligible in an overall materials requirements program. Yet if these supplies are not provided, planes now in use in business and agriculture will be grounded for want of spare parts, worn-out planes will not be replaced, and the small but useful lightplane industry will deterioriate and go under.

The AIA study showed that for 1949 the non-transport aircraft makers used 1337 tons of steel, 1666 tons of aluminum, 137 tons of copper and 91 tons of rubber. This compares with total production by the U. S. of 77,978,176 tons of steel, 603,462 tons of aluminum, 1,072,000 tons of copper and 1,211,582 tons of rubber. The non-transport plane builders would need only a quarter of one percent of the aluminum supply and even less of the other materials.

Full Steam Up on Flush-Deck Carrier

Navy's plans for a new 60,000-ton flush-deck carrier, slightly smaller successor to the ill-fated carrier United States, moved full speed ahead last week in Congress.

Rep. Carl Vinson, head of the House Armed Services Committee, introduced a bill calling for such a vessel, which he said now had White House approval. (Carrier United States never got beyond the keel-laying stage when she was canceled as an economy move by the then-Secretary of Defense Louis Johnson, obviously with White House approval.) But times have changed.

The new carrier will probably be named James V. Forrestal, after the first Secretary of Defense. The name has been proposed by Rep. Jack Anderson, member of Vinson's committee, and Vinson and other committee members have endorsed it.

Main purpose of the larger carrier, whose construction is to take approximately three and a half years, is to carry bigger and heavier carrier planes with longer ranges. They cannot be accommodated now, for landings at least, on the largest U. S. carriers presently in service.

It is expected to be a high-speed craft, as surface vessels go, with a number of modifications developed by Navy Bureau of Ships since the Midway class was built and since the United States design was scrapped.

Russian Planes

First close-up photos snipped from newsreel captured in Korea.

The first official close-up photos of Russian military aircraft seen in these parts since the end of the war have just been released by the Department of Defense.

Pictures are stills from a Russian propaganda newsreel which was captured in North Korea, and include the first photo of a new jet fighter, stablemate to the MiG-15, credited to Semyon A. Lavochkin (top photo, p. 17).

▶ **Newest Jet**—Designer Lavochkin's name has been conspicuously missing from the labels of Russia's newest aircraft. He has been supposedly working on jet designs, and in fact, has been listed as the designer of a sweptwing, night-fighting version of the German Messerschmitt 262. But a prize-winner and Hero of Socialist Labor is expected to continue producing, and thus it is possible that Lavochkin has finally come through.

This fighter and the MiG-15 (AVIATION WEEK Nov. 13, 1950 and Jan. 1, 1951) have much in common. Recognition differences would include the higher-mounted wing of the Lavochkin and the fairing on the under side of its fuselage. Incidentally, the first thought on seeing this fairing is that it conceals rocket-assist gear. But a second glance shows that the fairing is pretty small, and that it probably serves instead as a tail bumper.

Another item of interest is the German design influence, which is very apparent in the picture of the La, with its swept wing of nearly constant chord and its high-set tail.

The fuselage, of chubby and circular cross-section, owes its form most likely to the British ancestry of its engine, ex-Nene or Derwent, which now bears the name of Russian engine-designer Chelomey.

▶ **No Strange Ilyushin**—The long line of troop transport/cargo carriers with their crews is made up of 14 Ilyushin 12s, (second photo from top, p. 17) Aeroflot's standard medium-range airliner (AVIATION WEEK Jan. 23, 1950).

This 104-ft.-span plane is powered by two ASh engines which develop 1775 hp. each. Normal carrying capacity is listed as crew of 3 or 4 for military purposes (civil-use crew is 5, including stewardess) plus 27-32 passengers. The boys in front (apart from the crew) seem to be wearing paratroop gear, and since there aren't 32 of them, it is a reasonable assumption that the difference in the Il-12's carrying capacity is made up of weapons for these men.

Sergei Ilyushin is the designer of this craft, which is in service on the Polish and Czechoslovakian airlines, as well as in Russia. It was seen as a glider tug at the Tushino air display in 1949.

▶**Out of Seattle**—The Tu-4 is a very familiar face. It is a direct copy of, and in most details identical to Boeing's B-29. The ground photo only serves to confirm the impression that the Russians had copied every rivet and bolt (second photo from bottom).

But don't underrate Andrei Tupolev's accomplishments. Taking a few B-29s and disassembling them, bit by bit, in order to be able to build some more, is quite a feat. And the production knowledge gained during the process would not be inconsiderable, either.

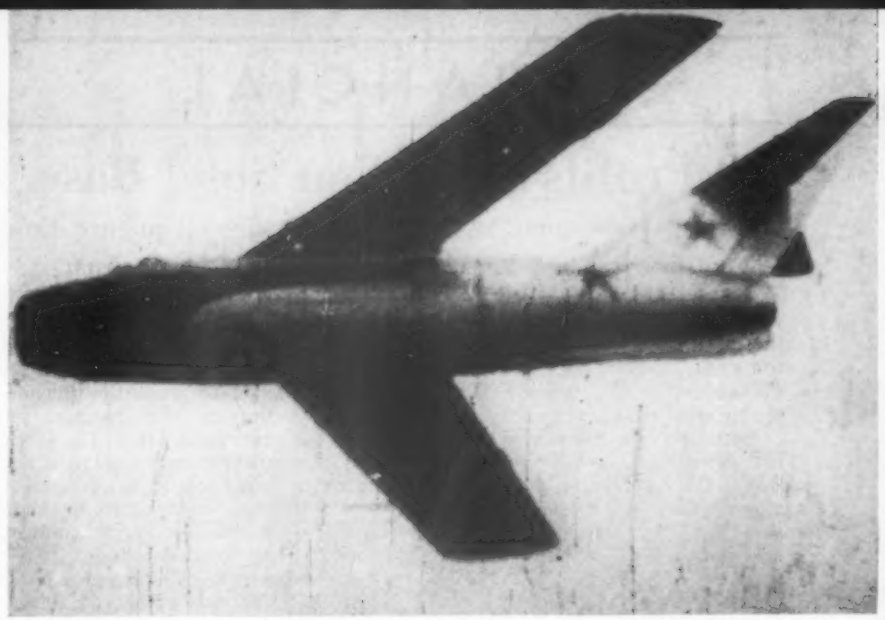
This airplane is becoming the standard heavy bomber of the Red Air Force, and it will be some time before its performance is matched or made obsolescent by more recent jet designs.

▶**Russia's First Jet**—The Yak-15, shown here in what appears to be squadron service, was Russia's first jet aircraft. It was a wartime marriage of a proven fighter airframe (the Yak-1 through -9 piston-engine series, first built in 1941) and a captured German Junkers Jumo 004 axial-flow jet engine. Aleksandir S. Yakovlev gets the design credits for this one (bottom photo).

Judging from photos, all of the Yak's venerable airframe was kept with the exception of the powerplant section ahead of the firewall and a small section of the fuselage belly. The 004 engine was then slung from some kind of engine mount, possibly picking up the original attachment points on the firewall. Air inlet is the simplest possible —a round hole just upstream of the engine; outlet is under the fuselage. It appears from the photo that a section of the bottom of the fuselage has been reworked to withstand the jet blast.

Dimensions are probably the same as those of the Yak-9 piston-engine series: Span, 32 ft. 10 in.; length, 29 ft.

This combination of ancient airframe and obsolescent engine should have a top speed not much greater than the best of the piston Yak series. The -9, with a 1310-hp. engine, is credited with a top speed of about 450 mph. On a good day, the Yak-15 might stretch that figure to 500 mph., but no more.



FINANCIAL

'50 Profits Rested on Solid Base

But recent entry of auto firms into aircraft picture dims otherwise bright prospects for high 1951 returns.

The sharp increase in backlogs and the prospects of additional business to come has had a tendency to overshadow the solid accomplishments of the aircraft builders during 1950.

Aircraft sales in 1950 were the product of orders placed well before Korea. But to the uninformed, the impression may be that such deliveries and earnings are a direct consequence of recent events and nothing but progressive multiple increases can be expected from now on.

For 1950, dollar sales of the 15 large aircraft units is estimated at about $2 billion. This compares with some $1.5 billion for the comparable 1949 period. The bulk of these sales represented military aircraft. But in a few cases, commercial deliveries represented an important segment of the total volume reported.

► **All Majors Profited**—All major aircraft companies are known to have shown operating profits last year. This is the first time this industry-wide accomplishment was recorded since 1945.

It is difficult to estimate the aggregate of industry profits for 1950 at this time due to the many qualifications found in contract price redeterminations and the renegotiation processes. (Even when earnings are reported, they will have a tentative note until renegotiation for the periods involved are completed.)

Using recent average profit margin experiences of 3 to 3½ percent after taxes, 1950 net profits may range from a total of about $60 to $70 million. This would compare with a total of more than $49 million shown for 1949. The industry's consistent progress becomes evident when it is realized that total profits in 1948 amounted to $16.8 million on sales of about $1.2 billion.

The average profit margin experience will vary widely for the separate aircraft companies, depending on individual efficiency factors and types of production. For example, Lockheed had important deliveries of its Constellation aircraft to commercial sources during 1950. With the original development and engineering costs previously amortized on this type airplane, current deliveries have a tendency to take higher profit margins than available through military bookings.

► **Selective Pattern**—A few aircraft units on the other hand have only recently completed the liquidation of their postwar losses resulting from unfortunate ventures. For instance, for its fiscal year ended July 31, 1950, Northrop Aircraft, Inc., showed a net operating profit of $2,441,426. But $3,500,000 was provided to liquidate the loss on the fixed-price contract covering the production of C-125. After adjustments, this loss was reduced to $2,486,399 and written off during the past fiscal year, leaving the company with a net loss of $44,974.

Northrop remains indebted to the Reconstruction Finance Corp. for loans previously advanced to help it through recent difficulties. As of July 31, 1950, this total debt amounted to $5,725,000. It is significant that until the RFC debt is liquidated, compensation payable to certain principal officers is limited, nor can dividends be paid on the capital stock without the agency's consent. The Korean war accelerated the flow of additional orders to Northrop and the company is now in a much better position to rehabilitate its finances.

The same selective pattern of production and earnings will prevail in the future. These trends will be strongly influenced by the early introduction of non-aviation interests in the manufacturing processes. This is particularly true of the automobile industry in sharing production of key aircraft types and powerplants with the air industry. This will tend to hold down volume and earnings of the prime builders.

► **Auto Makers Enter**—The military have indicated a strong desire to provide at least two sources of supply for each vital aircraft type, dispersing production sites at the same time. This has given the automobile group a potent opening wedge and the trend in this direction may be expected to continue.

Kaiser-Frazer, heavily in debt to the RFC, was aided by that agency in obtaining the franchise to build Fairchild C-119 Packets at Willow Run. It is known that Fairchild was anxious to build additional C-119s at any one of a number of vacant plants throughout the country. While the company will probably be assured of volume production at its main plant in Hagerstown, Md., its total overall expansion to deliver an increasing number of Packets needed will be limited.

Of major significance is the fact that its profits will be under a ceiling, with a second source of supply under another company's jurisdiction. Fairchild will collect fees for assistance in delivering engineering and production plans to Kaiser-Frazer but such income will fall far short of the earnings it could generate if this production remained completely under its wing.

► **Subcontracting Helps**—Aircraft companies who have followed an extensive subcontracting practice should do much better profitwise. For example, Grumman, Lockheed and Boeing are known to have augmented their productive potentialities considerably by extensive application of the subcontracting principle. In this manner, the prime contractor places itself in a position to accelerate its production levels. It usually remains the responsibility of the prime contractor to obtain all the required work either by subcontract or doing it directly at the lowest cost.

The subcontracting practice serves as a safety valve in avoiding sharp fluctuations in plant expansion and employment with subsequent deflationary adjustments. Nevertheless, the utilization of extensive subcontracting is no guarantee that a prime aircraft builder can prevent his product from being assigned for complete manufacture by another company.

As previous contracts are being completed, there may be a tendency for deliveries and earnings during the early periods of this year to show relative declines. This condition will apply to Boeing, for example, which is now winding up completion of its B-50 orders. Volume will not start up again until the B-47s are in accelerated production.

It is this type of performance which may confuse those who fully expect President Truman's estimate of a five-fold increase in aircraft production within one year to be fulfilled. The industry believes a three-fold expansion during the next twelve months is about the best that can now be expected under favorable conditions.

It is a safe surmise that with efficient management prevailing, earnings will have a tendency to mount in a direct ratio to the volume of aircraft production delivered.

The present excess profits tax measure, which imposes a top ceiling of 62 percent on combined normal and excess profits taxes, is no iron curtain to earnings. Net profit margins ranging from 3 to 4 percent, after all tax imposts, are quite possible for a number of key aircraft companies. This condition should readily permit a further increase in the overall industry earnings for 1951. —Selig Altschul

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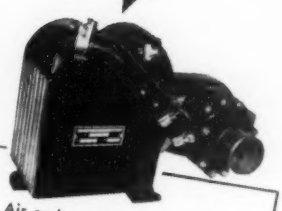
Stratos air cycle cooling units are *engineered* to meet these exacting demands. Extremely compact and very light, they deliver a high rate of flow of cooling air. Production models with air flow capacity ranging from 12 lb/min to 90 lb/min are standard equipment in combat aircraft of the U. S. Navy and the U. S. Air Force. Such high performance aircraft as McDonnell's F2H2 Banshee, Boeing's B-47 Stratojet, North American's AJ-1 Tornado, and the Douglas XA2D Skyshark are equipped with Stratos cooling packages.

Airlines, too, are using Stratos equipment in transport aircraft such as the Constellations of Pan American World Airways, and the Convair Flagships of American Airlines, in which Stratos equipment has proved its efficiency, low maintenance cost, and long period of service between overhauls.



Air cycle cooling package

•

OTHER STRATOS EQUIPMENT:

•

Cabin Superchargers
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For information on this and other Stratos equipment, write:

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FAIRCHILD ENGINE & AIRPLANE CORP.

Main Office and Plant: Farmingdale, Long Island, N. Y. • West Coast Office: 1307 Westwood Blvd., Los Angeles 24, Calif.

Other Divisions: Fairchild-NEPA Div., Oak Ridge, Tenn. • Fairchild Aircraft Div., Hagerstown, Md. • Fairchild Engine Div., Guided Missiles Div., Al-Fin Div., Farmingdale, N.Y.

ASSEMBLY area has neat bench arrangement; process rooms are beyond far wall.

GYRO assembly is done at these stations. Men here are working on vertical and rate gyros.

How Lear Handles Gyro Output

USAF quantity demand for delicate navigation units met by plant-within-plant set-up at Grand Rapids.

The problem of quickly transposing laboratory conditions to a large-scale precision assembly operation suddenly faced Lear, Inc., production men when five years of intensive development on delicate autopilots and gyros culminated in substantial orders from the USAF.

The products to be mass-produced required a dust-free controlled-temperature-and-humidity working area. Techniques and equipment had to be utilized and arranged which would permit gaging dimensions of one/ten-thousandth of an inch, dynamic balancing of rotors to five/millionths of an ounce-inch, and measuring of rotational friction resistances of one-half an inch-gram—all under a rigid production schedule.

One of the first steps was to make such a production facility available. Plant engineers and production specialists converted 5500 sq. ft. of floor space at Grand Rapids, Mich., into a layout capable of accommodating several score workers.

▶ **Cleanliness Paramount**—The area is broken down into several sections, with common walls predominantly of glass to permit visual observation between processing rooms and the main assembly area, but preventing the circulation of dirt or sound. All wall seams, window frames, and other openings are caulked and seamed. The ceiling is burlap surfaced and painted to prevent infiltration of dust from the floor above. The floor is covered with waxed rubber tile to eliminate dust-collecting crevices or depressions.

Procedures were instigated to reduce the amount of dust and lint brought into the rooms by personnel. Mats are installed outside the entrance doors where shoes must be cleaned before entering, and all personnel going into the area must wear Nylon smocks. Tool boxes, purses, or similar articles are not allowed within the working area, and neither are smoking, drinking or eating. Edges of parts containers are plastic coated to prevent formation of loose fibers and lint resulting from wear or scuffing.

Old wax on the floor is completely removed each week and new wax applied and buffed. All overhead pipes, ducts, lights and sprinkler fixtures are carefully washed. The floor is wet mopped after each working day.

All air is electronically filtered through the air-conditioning system by an electronic dust precipitator made by American Air Filter Co., Louisville, Ky. In the presence of an electrostatic field, dust particles are charged and attracted to plates of opposite polarity which are automatically cleaned in oil. A second filter stage of the conventional paper type is installed in series with the electrostatic filter so that the system will remain operative in event of power failure in the electrostatic system.

A regular check is maintained of the dust content of the air by means of an electrostatic sampler. Positive air pressure is maintained in the work area so that any air transfer is out of, rather than into the room.

▶ **Air Conditioning**—Temperature-humidity control is achieved through use of two 15-ton Carrier air-conditioning systems, which provide a complete change of room atmosphere every 12 min. adding 15 percent fresh air each time. In case of emergency, one of the systems is capable of maintaining the area in operating status. Temperature is held to 75 deg. within a tolerance of one degree and humidity is not permitted to exceed 50 percent.

General lighting is fluorescent at 50-ft.-candle level, with supplementary lighting at all work stations. Metal assembly benches covered with rubber mats at each work station are so arranged to permit flexible operation with changing work load.

▶ **Handy Power**—Each work station is supplied with conveniently grouped electric power outlets for 30v., 2-phase, 400-cycle; 115v., 3-phase, 400 cycle; and 115v., single-phase, 60-cycle ac., and 28v. dc. Outlets are arranged in ducts so as to be readily changed or moved to suit new arrangements. Power ducts are run below bench level. Vacuum lines are provided at work stations for cleaning parts of the gyro instruments. Air pressure lines are avail-

Whatever test specifications your product has to meet, you can depend on Bowser, because ***standard*** Bowser Environmental Simulation Chambers meet all Governmental test specs. In most cases **one** Bowser Unit will perform all the tests required. To meet unusual testing requirements special accessories and instrumentation can be furnished.

All Bowser Units are self-contained, and will automatically maintain preset conditions within close tolerances. Their design and rugged construction assures continuous operation for indefinite periods, yet they require no special skills to operate. To meet specific requirements, Units can be provided with automatic cycling of temperature, altitude and humidity.

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able for test tables and measuring devices. Air exhaust from the pressure lines is pumped outside the room to maintain dust-free conditions.

GE Jet Move

Lockland slated to be focal point of firm's jet engine operations.

General Electric, which has been getting more and more absorbed in its Lockland, O., J-47 operation, has finally jumped in with both feet. And according to the plans the company is shaping up for the huge World War II Wright engine plant, Lockland will become GE's jet headquarters.

There can be little doubt of the company's intentions along those lines. The new plans for Lockland include:

- **Move of executive,** engineering and commercial staffs to Ohio.
- **More than tripling** of the space now occupied by GE at the plant by purchase, lease and new construction.
- **Establishment of** J-47 manufacturing operations. Heretofore Lockland has been used solely to assemble components supplied by over 280 subcontractors.
- **Increasing assembly area,** making possible an increase in production by its subcontractors, which have been heretofore held down to GE's present assembly capacity.

Not only will assembly be stepped up and manufacture introduced, but facilities will be built for development of turbojet and turboprop engines.

When completed, Lockland facilities will be more than double those of the Lynn and Everett locations.

▶ **What's Involved**—Here's what the new multi-million dollar expansion will involve:

- **Purchase of the "north shop"** of the former Wright plant. GE has been leasing this from Electric Auto-Lite.
- **Leasing of additional space** in the "south shop," owned by Auto-Lite.
- **Purchase of an 80-acre** tract from the Pennsylvania Railroad and construction thereon of a two-story office building and a factory building.
- **Lease** of additional space in the Wright plant from the government, including at least part of the three government-owned foundry buildings.

The Lockland plant has a lot area of 358 acres and building area of 105 acres. Roofed area covers about 4.5 million sq. ft. Wright began operations in April 1941 and in July 1944 hit peak output of 3168 engines. The company built a total of 79,633 engines at Lockland and had peak employment of about 35,000.

Negotiated Contracts

Negotiated contracts totaling $2,440,356 are listed by the Air Force for the week ending Dec. 29, 1950.

Largest award, for $905,850, went to U. S. Gauge div., American Machine & Metals Co., Sellersville, Pa., for parachute ripcord releases. Jack & Heintz Precision Industries, Cleveland, received award of $876,295 for starters.

Bendix Products div., Bendix Aviation Corp., South Bend, Ind., spare parts for strut assemblies, Cl. 03G, $44,417.

H. B. Dick Co., Chicago, duplicating machine, Cl. 25A, $64,636.

Dumont Aviation & Supply Co., Long Beach, Calif., miscellaneous aircraft hardware, Cl. 04A, $46,652.

Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, N. J., aircraft accelerometers, Cl. 05C, $118,472.

B. F. Goodrich Co., Akron, de-icer shoes, Cl. 01D, $165,000; aircraft casings and tubes, Cl. 04C, $52,874.

Jack & Heintz Precision Industries, Cleveland, starters, Cl. 03C, $876,295.

North American Aviation, Inc., Los Angeles, modification kits, Cl. 01M, $33,074; special tools and ground handling equipment for aircraft, Cl. 01M, $30,000.

Pacific Piston Ring Co., Los Angeles, miscellaneous aircraft hardware, Cl. 04A, $52,030.

Page Steel & Wire div., American Chain & Cable, Monessen, Pa., steel wire, Cl. 23A, $51,056.

U. S. Gauge div., American Machine & Metals Co., Sellersville, Pa., release, parachute ripcord, Cl. 13, $905,850.

PRODUCTION BRIEFING

▶ **Fairchild Engine Division,** Farmingdale, L. I., N. Y. has leased storage and warehousing space at Long Beach, L. I. to free a corresponding area for production of jet engines and components at the Farmingdale plant.

▶ **Westinghouse Electric Corp.** announced formation of an Electronic Tube division and planning for three new plants to produce various types of tubes. Site studies for the plants are currently under way, with selections slated for the near future.

▶ **Canadian Car and Foundry Co.,** Montreal, got the lion's share of over $1.5-million worth of Canada's defense expenditures for the week of Dec. 11-16, 1950, with orders for aircraft repairs and parts totaling $842,523. De Havilland Aircraft of Canada, Toronto, received $419,161 worth of orders and MacDonald Bros. Ltd., Winnipeg, got contracts aggregating $264,775.

▶ **Gamewell Co.,** Newton, Mass., precision potentiometer maker, has doubled production in past six months due to increased defense orders.

USAF Awards

Air Materiel Command Procurement Division makes available to AVIATION WEEK recent bid awards, shown on this page. Requests for further information should be addressed to Contracting officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72.

ABSTRACTS

For steel (51-575):
Companies sharing: Crucible Steel Co. of America, Pittsburgh, on a bid of $3293.75, and Allegheny Ludlum Steel Corp., Brackenridge, Pa., on a bid of $1764.50.

For 50 sanders (51-685):
Earle Hart Woodworking Machine Co., Chicago, on a bid of $49,950.

For cylinder assemblies (51-698):
Companies sharing: Linde Air Products Co., New York, on a bid of $136,200; Norris Sta...ping & Mfg. Co., Los Angeles, on a bid of $37,760, and Duetsch Co., Los Angeles, on a bid of $22,900.

For 75 milling machines (51-853):
Cincinnati Milling & Grinding Machines, Inc., Cincinnati, on a bid of $251,636.

For cord (51-1055):
Companies sharing: Kings Electronics Co., Inc., Brooklyn, on a bid of $4085.22, and Harold Shevers, Inc., New York, on a bid of $2492.

For attenuators (51-974):
Hewlett-Packard Co., Palo Alto, Calif., on a bid of $5910.

For gasoline blowers (51-919):
Sprague Engineering & Sales, Gardena, Calif., on a bid of $97,465.50.

For steel (51-306):
Companies sharing: Tube Distributors Co., Inc., Brooklyn, on a bid of $73,548.99; Allegheny-Ludlum Steel Corp., Brackenridge, Pa., on a bid of $10,123.60; Ellwood Ivins Steel Tube Works Inc., Philadelphia, on a bid of $106,756.72, and Wallace Tube Co., Chicago, on a bid of $14,981.40.

For connector-receptacles (51-732):
Companies sharing: Westinghouse Electric Supply Co., Dayton, on a bid of $4718.40; American Phenolic Corp., Chicago, on a bid of $1940, and Continental Electronics Ltd., Brooklyn, on a bid of $7750.

For 9000 pints fuel tank sealant (51-753):
Products Research Co., Glendale, Calif., on a bid of $15,570.

For indicators (51-803):
Kollsman Instrument div., Square D Co., Elmhurst, N. Y., on a bid of $56,559.23.

For resistors (51-848):
Companies sharing: Standard Electrical Products Co., Dayton, on a bid of $2467.50; Instrument Resistor Co., Union, N. J., on a bid of $500, and Neptune Electronics Co., New York, on a bid of $1860.

For connector-plugs (51-864):
Cannon Electric Development Co., div. of Cannon Mfg. Corp., Los Angeles, on a bid of $47,587.80.

For plastics granulating machines (51-890):
Companies sharing: Hydraulic Press Mfg. Co., Mt. Gilead, O., on a bid of $23,190, and Cumberland Engineering Co., Inc., Providence, R. I., on a bid of $809.

For connector-receptacles (51-893):
Cannon Electric Development Co., Div. of Cannon Mfg. Corp., Los Angeles, on a bid of $24,768.80.

For 7000 metal shipping containers (51-421):
Cleveland Steel Barrel Co., Cleveland, on a bid of $12,180.

For bar assemblies (51-435):
Companies sharing: Wilson-Albrecht Co., Inc., Minneapolis, on a bid of $2983.50, and Zierden Co., Milwaukee, on a bid of $10,271.65.

For brass screws (51-532):
Companies sharing: Air Associates, Inc., Teterboro, on a bid of $1509.13; Aer-O-Line Mfg. & Supply Co., Burbank, Calif., on a bid of $817.14; Atlas Screw & Specialty Co., New York, on a bid of $1007.26; Reed & Prince Mfg. Co., Worcester, Mass., on a bid of $12,234.55, and Ohlson-Empire div., Ohlson International Corp., Long Island City, N. Y., on a bid of $174.42.

AF Invitations to Bid

Bid openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who write local field office, stating bid invitation number.

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

INVITATIONS

Test set adapter, 178 each, bid invitation No. 51-1380, issue date 29 Dec., delivery within 60 days after date of award.

Bench, work, 3000 each, bid invitation No. 51-1381, issue date 2 Jan., delivery to start in 40 days, complete within 210 days.

Rectifier, 1-8 items, bid invitation No. 51-1382, issue date 2 Jan., delivery to start in 45 days, complete within 210 days.

Antenna, 1 item, bid invitation No. 51-1388, issue date 2 Jan., delivery of 3 first articles within 30 days and 500 per month beginning 1 month after approval of first articles.

Machine, electric resistance spot welding, 1 each, bid invitation No. 51-1390, issue date 2 Jan., delivery within 60 days after date of award.

GREATER VALUE WITH BENDIX ELECTRICAL CONNECTORS

PRESSURE TIGHT SOCKET CONTACTS

PLUS

- Moisture-proof
- Radio Quiet
- Single-piece Inserts
- Vibration-proof
- Light Weight
- High Insulation Resistance
- Easy Assembly and Disassembly
- Fewer Parts than any other Connector
- No additional solder required

Outstanding design and precision workmanship assure completely pressurized electrical connectors for all sizes of contacts. A truly important feature, but only one of the many exclusive advantages that contribute toward making Bendix outstanding in the electrical connector field. Increased resistance to flash over and creepage is made possible by the use of Scinflex dielectric material—an exclusive development of Bendix. In temperature extremes, from −67°F. to +300°F. performance is remarkable. Dielectric strength is never less than 300 volts per mil. Remember, for the greatest value in electrical connectors, it pays to specify Bendix. Our sales department will gladly furnish complete information on request.

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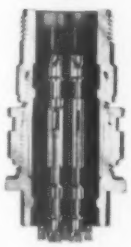

Pin and socket arrangements available for all sizes of contacts.

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High strength aluminum alloy . . . High resistance to corrosion . . . with surface finish.

CONTACTS
High current capacity . . . Low voltage drop.

SCINFLEX ONE-PIECE INSERT
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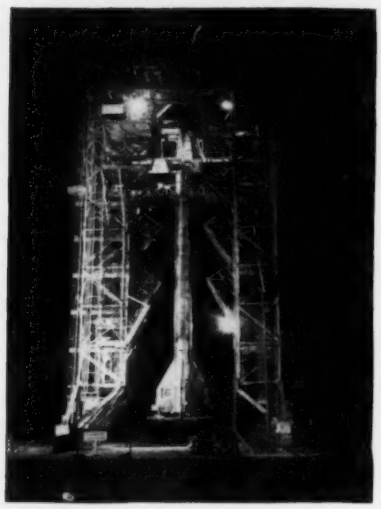
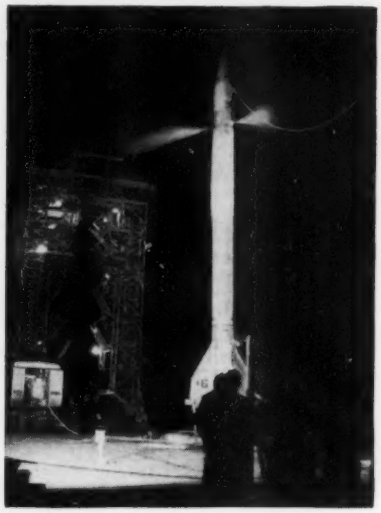


VIKING in gantry, being readied for . . .



NIGHT flight. Oxygen vents before . . .

FIRING, which nearly set new record.

Viking Flights Prove Research Worth

Martin-built test vehicle, designed to investigate upper atmosphere, completes six successful launchings.

Viking Six, one of the slim research rockets built by the Glenn L. Martin Co., roared off the firing table at White Sands Proving Ground and into the blackness of the night of Dec. 11, 1950.

For 65 sec. the rocket blasted through the sky and then, just as it had reached a speed of about 4000 fps., it quite unaccountably shut itself off.

Normally, this is no cause for rejoicing. With Viking Six there must have been bitter disappointment when the scientists later read the records. They showed that if the power had stayed on for 10 sec. more, a new altitude mark of 135 miles would have been set.

But there was sort of a silver lining to the dark cloud, after all. The night firing was basically successful, and the rocket was well on its way toward a record. And—more important—three Vikings in a row had been fired with signal success. Considering that the Germans popped off about 200 V-2s (and an unknown number of a scale model, the A5, developed to test stability and control) before they got a successful flight, the Viking achievement is outstanding.

► **First-Nighter**—This, the first night-fired Viking round, was flown, the Navy said, to take advantage of a meteorite shower—don't ask how. The rocket was instrumented primarily to measure atmospheric temperatures, pressures and densities. Secondary data were obtained for flight path, stabilization and rocket angle, motor performance, base pressures, skin and tail section temperatures in flight.

This seems like quite a slug of information to get from just one rocket firing. That's true enough—but the task has been simplified somewhat because Viking, unlike the workhorse V-2, was specifically designed for the job of scientific research.

In 1946 the Naval Research Laboratory established a general specification for a high-altitude sounding rocket. This spec arose out of two needs:

• **Atmospheric data were needed** for higher altitudes than the V-2 could achieve (114 mi. up is its domestic record);

• **Limited numbers of V-2** rockets were available and no more were to be built.

The specs—and the contract with Martin which followed—are a model of looseness. It is a tribute to any research outfit—and especially to a Naval one—that they were able to appreciate that the job could not be defined on a cut-and-dried basis.

► **Variable Payload**—Briefly, the NRL specs said that a vehicle should be built to carry a payload of from 100 to 1000 lb. to altitudes of over 100 mi. in an orderly fashion. And since the problem was one of designing a rocket vehicle to gather data which would be used to design it, the contract was written on a fire-and-fix basis. This meant that any changes indicated by the flight of a given round would be built into the next rocket.

So Viking was born. But it was first named Neptune and designated HASR-2 (for High-Altitude Sounding Rocket). Standardization of nomenclature in the missile field later changed the designation to RTV-12 and finally to RTV-N-12 (for Research Test Vehicle—Navy—12). Meanwhile, the name Neptune was dropped to avoid confusion with the airplane of the same name. After a brief period, during which Martin personnel called it Marco Polo, the rocket finally had its name legalized to Viking.

► **Rocket-Propelled** — Basically, the Viking can be described by saying that it a rocket-propelled research vehicle which looks like most other rockets. It is tall (just under 50 ft.) and slim (32 in. diameter) and has four fins. The motor (Reaction Motors, Inc., XLR 10-RM-2 20,000-lb. unit) is in the tail section and the instruments are up front. Between there is a slew of cold and hot viscera.

Viking (and any other rocket) is generally described starting at the nose, which becomes the top when the missile is standing on its fins ready to fire.

(At White Sands Proving Ground, rockets are lined up to fire north. Fins are designated by the name of the compass direction to which they point, and the missile is divided into four quadrants between these directions. In

flight, pitch movements are referred to a north-south plane and yaw to an east-west plane.)

▶**Quintuple Division**—Viking is divided functionally into five sections:

• **Instrumentation,** in the top 78 in. of the body. This compartment is clad in stainless steel and is sealed against pressure leakage.

• **Controls,** in a bay just below the instruments. Batteries, power supply, gyros, junction boxes and amplifiers are in this aluminum-skinned section.

• **Pressurizing system,** in the next section down. Here are housed the storage spheres, valves and regulators. Here also are the tumblejets—small controlled streams of gas which provide lateral thrusts to control the rocket in pitch and yaw.

• **Propellant tanks.** Liquid oxygen is the oxidizer and is in the upper tank. In the first two Vikings, this was a separate insulated tank, but on the third, and subsequent, it is an integral tank. Ethyl alcohol—500 gal. of it—is the fuel in the lower tank. In the center of this tank is a conduit which leads the liquid oxygen—loxygen, or lox, for short—through to the engine.

• **Tail section,** which contains most of the powerplant. The upper end houses two propellant pumps which are driven by a turbine. The turbine in turn is powered by steam formed by the decomposition of hydrogen peroxide. The tank for peroxide is in the form of a helical coil surrounding the pumps and turbine. Centerline of the combination lines up with the rocket thrust axis.

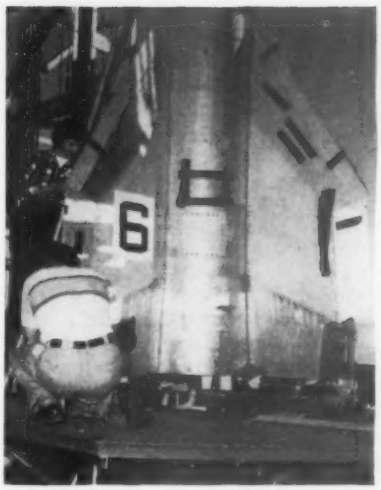
The rocket engine is gimbal-mounted and moved, by electrically controlled hydraulic servos, to steer the rocket while power is on.

Fins are supersonic airfoil sections with wedge leading and trailing edges, flat sides. Tabs are located on the outboard end of each fin to correct for the misalignment of that fin. Leading edge and tip sections of the fins are stainless steel, because of the high temperatures reached on these portions.

Cables and tubing ran through the propellant tanks in the first two rounds, but in the third round they were replaced by external conduits in the northeast quadrant.

Pitch and yaw control of the Viking during powered flight is handled by motion of the thrust axis. Roll control comes from tabs on the east and west fins, interconnected with exhaust steam valves. (Steam comes from the pump turbine.) The tabs and steam discharge provide the necessary offset moment to roll the rocket.

After powerplant cutoff, control and steering passes to the tumblejets. Yaw and pitch jets are in the pressure compartment near the nose; roll jets are located in the fins.



VIKING SIX fins get last-minute treatment after installation of telemetering.

BLOCKHOUSE with instruments, controls and communications is firing nerve center.

▶**Ground Gear**—In addition to the built-in equipment, there are a number of ground installations required for the firings. (As a parallel case, the Germans built or adapted no less than 32 different vehicles for their field firings with the V-2.)

For Viking, most of the installations are portable and not part of the Proving Ground. This ancillary equipment includes:

• **Transport cart,** for moving the rocket between ground points. This is basically a tricycle structure with a tow-bar, the latter doubling as a lifting bar for the rocket erection.

• **Work stands.** These are specially built for each major section of the Viking, and are used during preflight inspection and tests in the hangar. Each stand has electrical power and shop air outlets.

• **Test boxes,** for preflight proving of systems and components. These include such things as gyro checkers and firing sequence switches checker.

• **Firing table,** for holding the rocket before firing. This is a simple welded steel structure which can be tilted for initial headings uprange or crossrange.

• **Replacement structure** for the south fin. During static firings which precede flights, the entire south fin of the missile and some adjacent skin is removed for access and observation. A special structure has been built to replace the fin during these operations.

• **Portable terminal cart.** This is a vehicle which contains a set of connections, instrument adjustments and other circuits useful to the rocket both in the hangar and at the firing site. An additional set of wires connects an identical pair of these cars at the firing site—one in the blockhouse, and one near the launching area.

• **Control test panel.** This panel permits remote reading and operation of the control system from the blockhouse.

• **Firing desk.** Here is really the heart of Viking operation because this desk mounts the sequence switches for starting and stopping the powerplant, and the necessary instrumentation.

• **Gas charger,** for high-pressure delivery of gases. Nitrogen or any other gas generally comes commercially in cylinders at about 2000 psi. pressure. Since Viking's pressure sphere requires nitrogen at about 4000 psi., a repressurizing system is necessary.

• **Hydraulic power supply.** This is a commercial item which has been reworked to run at demand flows of about 12 gpm. up to 2500 psi. pressure.

• **Servicing connectors,** for propellant flow control during tanking. These are designed to handle the flow of each particular propellant from transporting carts to the rocket.

For the shipboard launching of Viking Four, launching rails and a different firing table were supplied.

And in addition to all this specialized equipment, there is much gear at WSPG shared by Viking, the V-2 program and other missile firing groups. These would all use the gantry crane, the blockhouse and the launching site and pit.

▶**Takes Time**—Some idea of the complexity of operations with this or any other rocket can be gained by the study of Viking One's time schedule. It should be remembered that this was to be the first all-American round as big as a V-2; that it was a costly venture; that there was a great deal of pride involved; a mistake could be not only expensive but dangerous.

Martin divides Viking operations into two: horizontal and vertical. These are preceded by a preparation period and followed by a report and cleanup. Preparation period length depends on

the NRL experimental schedule and the number of changes to be made by Martin. It has been as long a period as 15 weeks, and as short as three, the smaller figure being the one for the shipboard firing.

Report and cleanup varies from one to five weeks.

Horizontal operations include receiving inspection at WSPG; completion, special installations and changes; functional tests, radio interference tests and firing area and trailer preparations.

Normally, this part of the routine take 14 days.

Vertical operations include all preflight tests and cleanups, servicing, static firing operations and a post-static inspection, and prefiring tests.

First of the prefiring tests repeats most of the functional tests run during the horizontal operations, and generally runs about two days of work. Second set is done on the afternoon or evening preceding a firing, and repeats the highlights of the previous test.

Cleanup is the last check, and takes place about four hours before firing (X-hour).

► **On Time**—By now, everybody in on the launching is adhering to a rigid time schedule and servicing begins. First, alcohol is pumped into its tank. Then the peroxide tank is filled. The rocket motor igniter is installed next. Liquid oxygen goes aboard, followed by the pressurizing gas. This last operation is not actually completed until after flight firing operations have begun at X-minus-15 minutes.

The way the sequence strung itself out for the first round is chronicled below.

December, 1948: Viking One was assembled and shipped.

January, 1949: Viking One arrived at WSPG—one year late.

Feb. 1, 1949: Rocket was moved to the firing site and erected. Ground checks, servicing and static firings were rehearsed, and the rocket was returned to the hangar.

Feb. 28: Rocket again erected, vertical operations begun.

Mar. 7: Static firing attempted. Halted at X-15 min. because of faulty mating of nose disconnect plug.

Mar. 8: Static firing attempted. Halted because oxygen vent valves would not close fully, and drained the nitrogen supply. Firing was attempted again with apparently working valves, and helium was used to augment the nitrogen. This burst a line, and the rocket went back to the hangar for repairs.

Mar. 11: Rocket was static-fired for 31 sec. Fire burned insulation of exhaust steam lines. Exhaust steam leaked from between turbine halves. Rocket was returned to hangar for repairs.

Apr. 22: Reerected at firing site. Vertical operations showed up chatter in the control system, characterized by rapid oscillations of the rocket engine.

Apr. 25: Second static firing after chatter elimination. Smoke showed and motor was shut down at 24 sec. Smoke was traced to new insulation baking on hot steam lines, so rocket was cleared for flight.

Apr. 28: Firing scheduled, but canceled because of weather.

Apr. 29: Firing canceled because of faulty operation of oxygen vent valves.

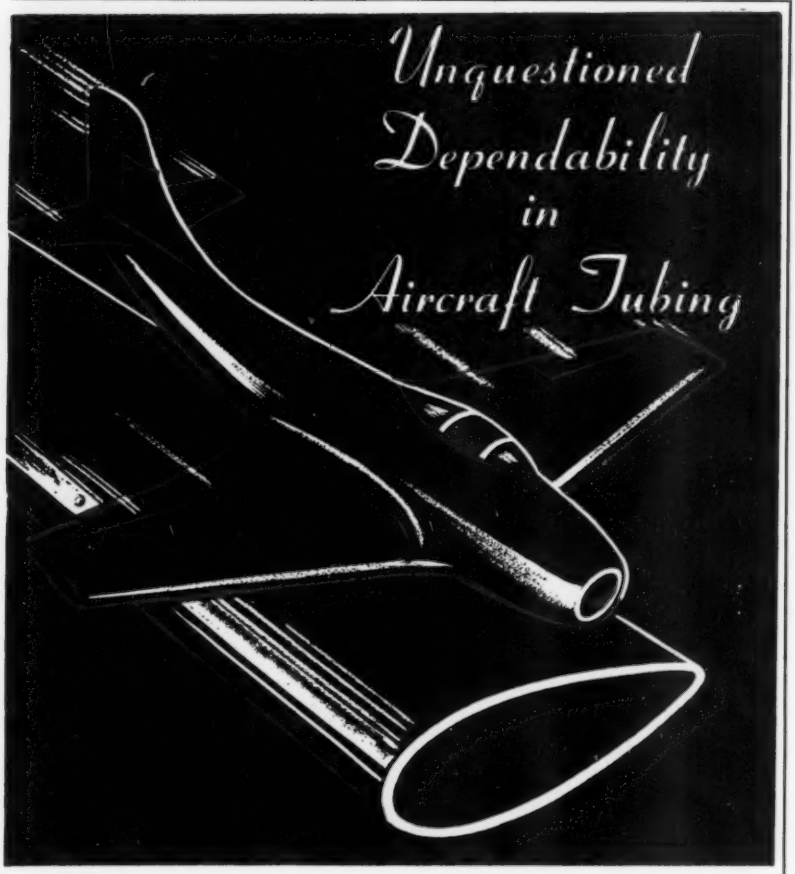
May 2: Operations had begun when a yaw servo was discovered broken.

May 3: Delayed firing because of faulty oxygen vent valves, but rocket finally got away.

► **Round-By-Round**—Viking One flew a normal trajectory and reached a peak altitude of 50.4 mi. after 163 sec. Premature cutoff of the rocket motor at 53.2 sec. contributed to this off-design performance.

Viking Two got away on Sept. 6, 1949. Again premature cutoff shortened the flight. Zenith was only at 32.3 mi.

Viking Three was to be the forerunner of the shipboard rocket, so was planned to be identical to round Four. This meant more time was spent in preparations and changes, redesigning equipment for use at sea and revising procedures. This round was received



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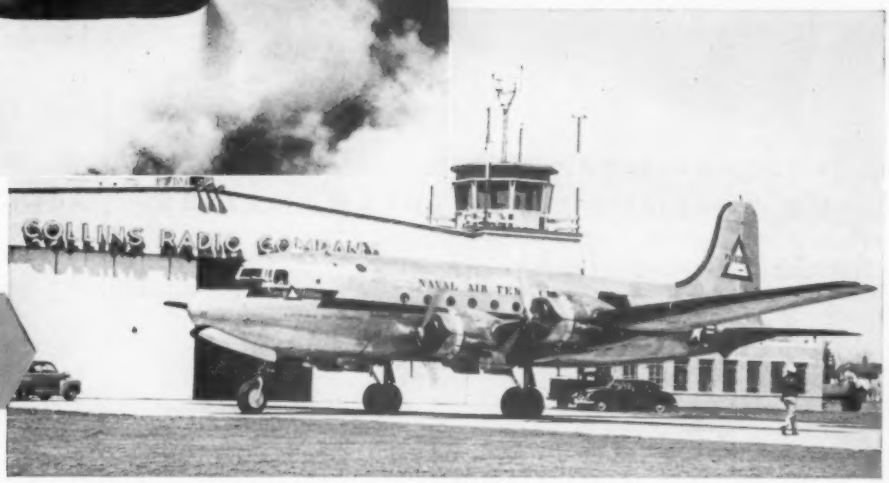
The Air Force is making evaluation tests of the Steering Computer in a B-26 Invader. Official Dept. of Defense Photo.



Navy Delta at Collins hangar for installation of Steering Computer.

The Collins Steering Computer Flies with the Navy and Air Force

Both the Navy and Air Force have extensive tests under way for determining the place the Collins Steering Computer will have in their program for fitting all aircraft with the most modern aids for air navigation and flight control. This equipment greatly simplifies ILS approach flying by computing, instant-by-instant, easily interpreted steering information for the pilot. Data from the aircraft's primary navigation and landing aids, radio, compass, gyro and altimeter are fed into the computer, and the combined result is clearly presented on cross pointers.

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3	2"	11S3	36SR3
4	2"	11S4	36SR4
5	3"	10S5	37SR5
6	3"	10S6	37SR6
8	3"	10S8	37SR8
9	3"	10S9	37SR9
10	3"	10S10	37SR10
12	3"	10S12	37SR12
16	3"	10S16	37SR16
18	3"	10S18	37SR18
20	3"	10S20	37SR20
24	4"	27S24B2	38SR24
28	4"	27S28B4	38SR28
40	4"	38S2C	

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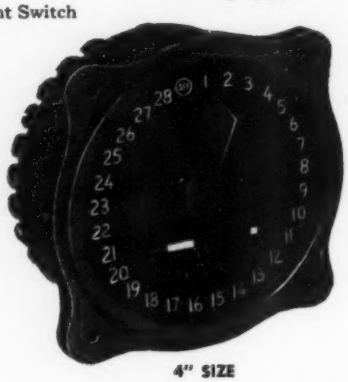
4" SIZE

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on Jan. 9, 1950 and fired—more or less successfully—on Feb. 9. Actually the round was cut off from the ground for reasons of range safety—it must have drifted crossrange too fast and was in danger of landing outside the range limits. Peak altitude was about 50 mi.

Viking Four was the now-famous record firing from the U.S.S. Norton Sound, a converted seaplane tender. On May 11, 1950, the rocket carried almost half a ton of instruments to a new altitude record for American-built rockets—106.4 mi. And the flight also marked the first successful at-sea firing of a rocket this size.

Viking Five was fired at White Sands Nov. 21, and soared 107 mi. high on a second record-breaking flight.

Viking Six, had it continued to burnout, would have coasted to a final height of 135 mi.

▶**Where To**—What's next with Viking?

There are four more being built by Martin, and that is the sum total of available knowledge on future plans. But the next step could be the breaking of the V-2 record—not merely to better the mark, but for the sake of the high-altitude data. Then perhaps there could be a nearly horizontal flight, or one fired solely for distance, instead of altitude.

Whatever it be, though, you haven't heard the last of Viking. Its influence will be felt in future applications of weather control, long-distance communications, high-altitude physiology and missile design.

Today, the Viking, like its oldtime namesakes, explores uncharted areas so that those who follow will have some knowledge of how to plot their courses.

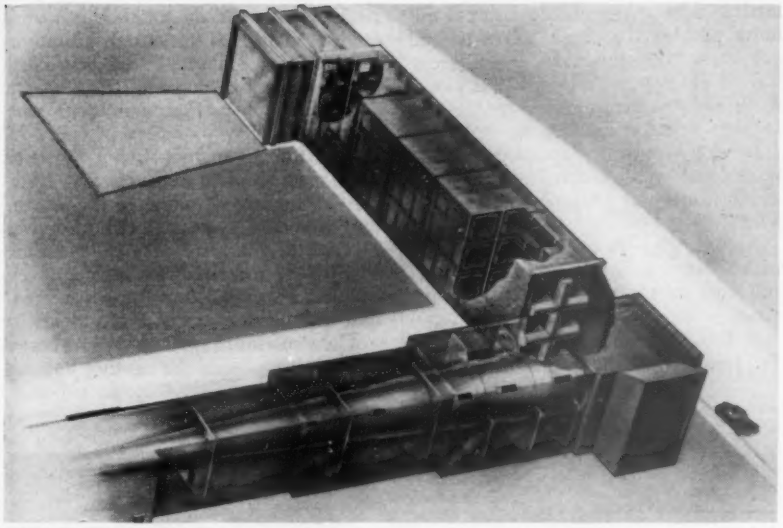
Ref: Operations with the High Altitude Sounding Rocket Viking, by J. P. Layton. Presented at American Rocket Society National Convention, Nov. 30, 1950.

Symposium Looks at Human Body

Two papers considering the human body as a factor in aeronautical engineering were on the agenda for a symposium presented by the Case Institute of Technology at Cleveland, Dec. 28, 1950.

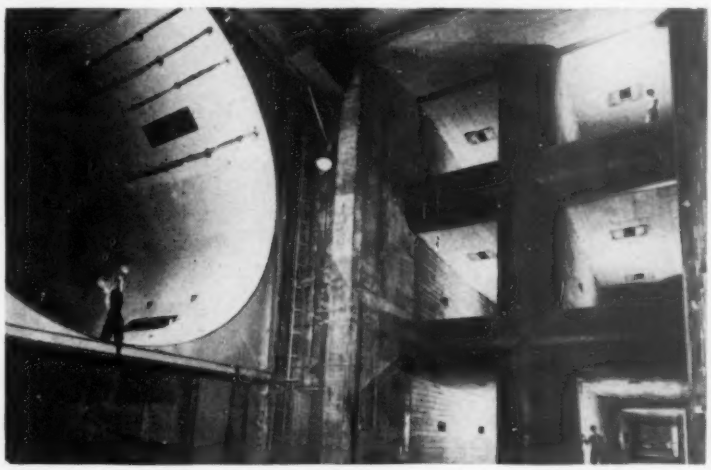
The symposium was part of a five-day meeting of the American Association for the Advancement of Science.

Speakers listed for the meeting included A. P. Gagge of the Surgeon General's office, USAF, who was to present a paper, "The Human Body as a Limiting Factor in Aeronautical Engineering," and Walter Grether, Chief of Psychology Branch, Aero-Medical Laboratory, Wright-Patterson AFB, whose contribution was titled, "Psychological Factors in Equipment Design."

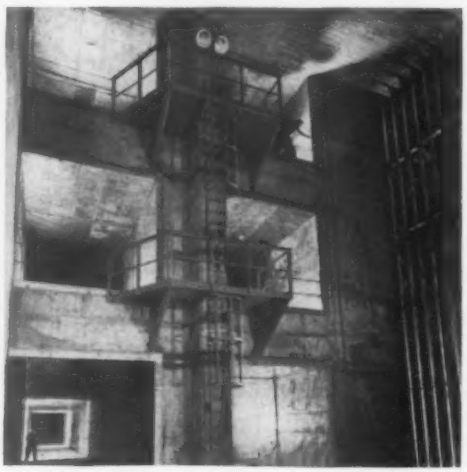


TRUMPET DIFFUSER for acoustical treatment in 5 to 11-cycle range is shown in foreground of NACA Lewis Lab 8x16-ft. supersonic tunnel sound control facilities.

DIFFUSER discharge end showing location of Helmholtz resonator openings.



ACOUSTICAL HOUSE addition, intake end, showing six passages and arrangement of resonator installations. Trumpet diffuser discharge end is at left.



OUTLET end of passages showing Fiberglas panel lining accommodating range from 20 cycles up.

New Acoustical Plan Kills Tunnel Noise

Wide frequency range starting at 5 cps. is handled by novel scheme using resonators, Fiberglas panels.

Engineers at NACA's Lewis Flight Propulsion Laboratory are using a modified "trumpet" to mute the "music" of its 8 x 6-ft. supersonic tunnel.

Trouble arose when a ramjet was operated under supersonic speed conditions in the test facility. Noise of such magnitude resulted that residents as far as two miles from the tunnel were disturbed, windows were reported broken, plaster jarred loose from walls. And since almost all the testing was done at night (because of the power load), the noise was especially objectionable.

The disturbance was created by the energy generated by the tunnel's 87,000-hp. compressor, which sent shock waves and enormous quantities of turbulent air pounding against the tunnel walls; and by the roar of combustion from the ramjet.

▶ **Low Frequencies**—The tunnel conditions resulted in a sound output of extremely high intensity down in the 5 to 30-cps. range. Such frequencies produce pressure waves through the atmosphere that cannot be heard but are of such intensity as to vibrate structures at considerable distances and rattle windows, doors, and dishes.

Conventional types of acoustical treatment do not absorb low-level sound frequencies of this intensity, NACA reports, and there was little technical information available about attenuation of low-frequency noise. Special acoustical designs were needed to dissipate the low-level sound starting at 5 cps.

And it was deemed necessary to devise new methods in order to control the wind tunnel noise conditions which were contemplated in the wide range of combustion research that had been planned for the future.

▶ **New Data Used**—Under the direction of Massachusetts Institute of Technology scientists, an extensive research program was started at the Lewis Laboratory.

In addition to developing funda-

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mental data on sound pressures and noise problems at high intensity and extremely low frequencies, it was necessary to develop a treatment that would withstand temperatures up to 300 F. in high velocity air streams.

In the meantime, operation of the tunnel had been restricted to conditions which would not produce objectionable noise.

Accordingly, research was pushed with accurate scale models of the tunnel and various types of acoustical treatment.

A basic scientific analysis facilitated the solution of the problem: In connection with the doctorate thesis of a student in the MIT acoustics lab, some new information had been developed which made it possible to calculate acoustic resonators accurately at very low frequencies.

▶ **Slots for Resonators**—Using the data developed through research and tests, NACA engineers completed the design, and the new acoustical structure was erected in four months. The tunnel was back in operation within seven months from the time the noise problem first occurred.

Construction now consists of a series of resonators inside the existing housing

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for the 230-ft., trumpet-shaped subsonic diffuser and in an addition to the original acoustical house.

Concrete partitions were erected at five stations within the diffuser housing and slots were cut in the diffuser bays between partitions, producing a resonator to attenuate effectively within its design frequency range. The acoustical treatment in this subsonic diffuser handles the 5 to 11-cps. range.

▶**Ducts Added**—From the diffuser, the air stream is discharged into a concrete chamber, its rear wall lined with staggered rows of conventional 4-in. perforated metal acoustical panels filled with Fiberglas. Noise from the diffuser is directed against this panel maze.

In the concrete chamber the air is turned 90 deg. into six parallel 10 x 10-ft. ducts. This arrangement was required to handle the tremendous air flow (about 2 million cfm.) and still maintain a low pressure drop to prevent excessive overload on compressor and motor drive.

▶**Duct Makeup**—First portion of each of the six ducts has five resonator sections to handle sound from 11 through 20 cps., progressing from the lower frequencies in the upstream portion through the higher frequencies downstream in the ducts. Four slots in the 6-in. thick concrete duct walls open into a resonator chamber partitioned off from the preceding chamber.

Last section of each of the six ducts is similar in cross-section to the resonator portion, but the wall is made up of 6-in.-thick panels of Fiberglas covered with perforated metal. These panels are attached to the partition bulkheads that divide the air chambers in back of the duct walls. This part of the installation is effective over a range from 20 to 200 cps.

▶**Discharge Chamber**—After passing through the ducts, the air flows into another large concrete chamber. Conventional 4-in.-thick acoustical panels are placed flat against the far wall. Discharge to atmosphere is at 90 deg. to ducting exit.

Filling the discharge opening are 4-in.-thick, Fiberglas-filled, perforated panels placed on 16-in. centers.

The conventional panels used in both discharge chambers and in the opening to the atmosphere are effective attenuators from 200 cps. and up, thus taking care of the higher frequency levels found in the tunnel operation.

The acoustical housing structure's outside walls are 12 in. reinforced concrete. All walls, roofs and duct liners have isolated breaks to prevent noise from traveling through the structure.

Directing the acoustical research on the tunnel was the consulting firm of Bolt, Beranek and Newman, whose three members are associated with the Acoustics Laboratory at MIT.

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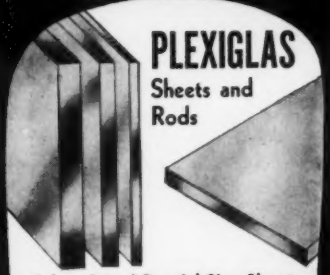

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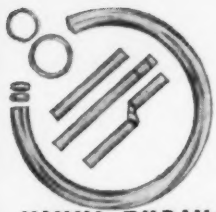

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New French Aerobatic Glider

France's jet-powered Fouga Cyclope aerobatic glider, first flown on Aug. 8, is being put through its paces at the Bretigny flight test center.

This exceptionally clean prototype, the CM.8-R9,8-01, is of wood and metal construction and carries a Turbomeca turbojet developing a maximum static thrust of 352 lb. and maximum continuous static thrust of 282 lb. A second prototype is under construction at the Aire-sur-L'Adour plant.

Except for the piggy-back jet, the Cyclope bears a general resemblance to the Prue 215 (AVIATION WEEK, Sept. 18, 1950), but the latter is a cleaner craft, with shallow cockpit faired smooth with fuselage contour.

The French craft's wing mounts flaps and air brakes. End plates on the wing complement the single main and nose landing wheels.

Span is 28.8 ft.; wing area, 105.4 sq. ft.; length, 21.9 ft.

Weight of airframe is 628 lb.; engine, 154.2 lb.; fittings and equipment, 88 lb.; fuel and oil, 169.5 lb.; pilot, 182.5 lb. This allocation gives a total weight of 1222 lb. Wing loading is 11.6 lb./sq. ft.; power loading, 3.47 lb./lb. thrust.

Maximum allowable dive speed is 279 mph., maximum cruise at 13,120 ft., 218 mph. Rate of climb at sea level is 1870 fpm. Ceiling, limited by fuel capacity, is 31,200 ft. Still air range at an altitude of 13,120 ft. is 186.5 mi.

Takeoff run is 820 ft.; distance to clear 65.5-ft. obstacle, 1115 ft.

Antisymmetric Span Loading Studied

Sweepback and low aspect ratio have been twin monkeywrenches thrown into the well-oiled machinery of routine aerodynamic calculations.

There was a time when one of the most difficult tasks confronting any aerodynamicist was finding one particular report of many available which would contain all the steps of his proposed study laid out for him. Once the report was in his hands, performance data or spanwise loading distributions followed rapidly.

Now, of course, the program is different. Reports just don't exist in some of the fancier phases of the advanced art of aerodynamics—or if they do, they always seem to apply to a case just enough different that the reports can't be used anyway.

► **Backlogged Data**—For the past three years, the National Advisory Committee for Aeronautics has been publishing additions to the literature of aerodynamics which account for some of the effects of sweepback and low aspect ratio. NACA's publications have considered mostly span loading including the effects of roll and sideslip.

The latest of these NACA papers is Tech. Note 2140, Theoretical Antisymmetric Span Loading for Wings of Arbitrary Plan Form at Subsonic Speeds, by John DeYoung, Ames Aeronautical Laboratory, Moffett Field, Calif.

DeYoung's paper is generalized to a high degree. It presents charts which determine antisymmetric loading for any arbitrary antisymmetric angle of attack.

The charts are limited only to wings of symmetric plan form with constant spanwise sweep angle of the quarter-chord line. Further, consideration is given to the flexible wing in roll and to the aerodynamic characteristics due to roll, aileron deflection and sideslip.

► **Lifting-Surface Used**—The classic lifting-line theory becomes inadequate for wings with sweep and low aspect ratios. Consequently, the more complex lifting surface theories must be used. DeYoung considers a lifting vortex located at the wing quarter-chord line as a simplification of the lifting-surface theory.

Antisymmetric load distributions are obtained by the solution of three simultaneous equations. Coefficients of these equations are presented in parameter charts which account for wing geometry, compressibility and sectio.. lift-curve

slope. Once the angle of attack distribution is chosen, the loading for an arbitrary antisymmetric angle of attack distribution can be found.

For antisymmetric loading, roll and aileron deflection, the angle of attack distribution is given and simultaneous equations have to be found. Loading in these cases is then obtained by inserting in the proper equations coefficients corresponding to wing geometry, Mach number and lift-curve slope. These coefficients are also presented in chart form.

▶ **Roll Characteristics**—Rolling moments due to roll and to aileron deflection can also be obtained from integration formulas presented by DeYoung. Rolling moment due to sideslip of a wing with dihedral is shown equivalent to the rolling moment due to aileron deflection, and procedures for determining its value are given.

For the special case of straight-taper wings, load distributions and values of the rolling moment coefficients are given in chart form for a range of wing plan forms.

Verification of the theory, bot experimental and theoretical (by use of electromagnetic analogy) is shown to be good. Application of the theory can be made for large aerodynamic angles, provided the flow does not become separated.

Compressibility corrections are valid up to sonic speed, subject to the usual limitations of linearized compressible-flow equations.

Swedes Pooling Their Jet Know-How

(*McGraw-Hill World News*)

Stockholm—Two Swedish engineering companies, STAL and Svenska Flygmotor AB, are pooling resources to develop a new jet engine for the Swedish air force. So far, Swedish jet fighters have been equipped with British-designed engines, made in Sweden at the Flygmotor plant in Trollhattan (AVIATION WEEK Jan. 8).

In the fall of 1949, STAL (Svenska Turbinfabriks AB Ljungstrom) exhibited an experimental jet engine (the Skuten) of its own design. This was an axial-flow type, with six combustion chambers and a fixed tailpipe. But thrust was only 3200 lb. While on exhibit, the engine was guarded day and night, and no other details were released.

The engine now slated for joint development by STAL and Flygmotor will follow on the lines of the Skuten, but with at least 50 percent greater thrust. It is intended for the fighter which is now being designed by SAAB to succeed the J-29.

Process Hardens Stainless Steel

Westinghouse Electric Corp. has announced a new process which increases the hardness of stainless steel by about 100 percent, and at the same time improves other of the metal's physical properties.

The process, given the name of Zerolling, resulted from the follow-up of an unexpected result of routine tests.

Westinghouse scientists expected to determine the characteristic properties of a batch of cast stainless steel samples from Crane Co. laboratories, and in the course of these studies, conducted some low-temperature (—300 deg. F.) impact tests. After finishing the tests, they discovered a strong magnetic effect in one of the samples which had returned to room temperature. When other samples were broken at room temperature, they did not show magnetic effects.

Subsequent tests showed that temperature alone was not a factor—that apparently the increase in magnetic permeability had been caused by a combination of severe plastic deformation and low temperature.

▶ **Research Clue**—The presence of the magnetic effect suggested that other

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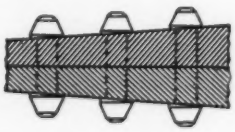


The Dowel Pin is available in any size—any length.

Precision fit, flexibility to mold to irregular surfaces and elimination of spot-facing will reduce manufacturing costs.

May we supply you with additional details? Write today.

U.S. and foreign patents—trademark registered

THE *hi-shear* RIVET TOOL CO.
1559 SEPULVEDA BOULEVARD
HERMOSA BEACH, CALIF.

physical property improvements could be expected by working stainless steel at very low temperatures. Dr. Ziegler of Crane Co. (which furnished the original stainless test samples) made tests which confirmed that hardness had indeed increased in the section adjacent to the fractures, and that this hardness was two to three times increased over the "as-cast" condition.

Dr. Ziegler and P. H. Brace of Westinghouse began a series of cooperative studies, with Westinghouse engineers under Brace exploring the effects of rolling and drawing at sub-zero temperatures.

Highest hardness and strength values were obtained with specimens rolled at the lowest temperatures. Tensile strength, yield stress and hardness were increased more than with conventional rolling.

The proportional limit (end of the linear portion of the stress-strain diagram) was doubled by this cold-working process. Torsional yield stress and fatigue strength were also increased, each by about half

▶ **Wear Improved**—More remarkable than these changes was one which occurred in wear performance. Austenitic stainless steels worked by conventional methods show a very low wear resistance when compared with some of the cobalt-chromium alloys usually used because of their resistance to sliding friction wear.

In spite of this usual and normal behavior of stainless steels, one of the tested specimens, which differed slightly in composition from the others, showed wear performance equal to or better than that of the best wear-resistant combinations. This characteristic did not show up in the other samples to as great a degree, but the possibility exists, says Westinghouse, that these unusual results can be reproduced consistently.

RUSCO for Safety Belts

Here is another example of Rusco Research, a shoulder strap for every Rusco Safety Belt.

Good practice requires that safety belts be replaced periodically.

Why don't you replace yours now with a famous Rusco Safety Belt.

RUSCO AERO PRODUCTS

THE RUSSELL MANUFACTURING CO.
Middletown, Conn.
New York - Chicago - Detroit - San Francisco

Clothing Protects Rocket Fuel Handlers

Loading liquid rocket propellants requires a well-dressed man—but his clothing has to be functional, not fashionable.

What he wears has to be able to provide protection against toxic gases, concentrated acids or other poisonous materials.

Take aniline, for instance. It is used as a rocket fuel, generally with red fuming nitric acid as an oxidizer. The worst property of aniline is that it can readily be absorbed through the skin. And in sufficient quantity, it is very deadly.

So special clothing is a must, because regardless of the handler's ability, accidents can happen.

▶ **The Problem**—Two years ago, the Clothing Branch of Air Materiel Command's Aero Medical Lab. began work developing special garments intended to give:

- **Protection** for the entire body.
- **Cooling,** because the interior of protective clothing gets hot.
- **Comfort,** because of the hazardous effects of poorly-fitting or stiff clothing.

Latest product of AMC's development is a coverall and hood assembly made of vinyl-impregnated Fiberglas plus butyl rubber boots and vinyl-coated cotton gloves. The hood has a plastic visor for front and side vision.

Two methods of interior cooling have been devised: blast air and water evaporation.

For the former, an air-ventilated harness attached to a nylon suit is worn under the protective coverall. Circulating air comes from an expansion turbine of the type used to cool fighter plane cockpits. The air prevents toxic fumes from entering the hood and eliminates the need for a respirator.

In the case of water evaporation, an outer shell of cotton fits over the coverall and the cotton is saturated with water. A demand air breathing apparatus is provided for this suit.

Currently, engineers favor the water-evaporation suit because of its economy and greater comfort.

Two metals for high temperatures

INCONEL
INCONEL "X"

Offering exceptional hot strength and high corrosion-resistance, these high-nickel alloys solve aircraft "hot-spot" problems.

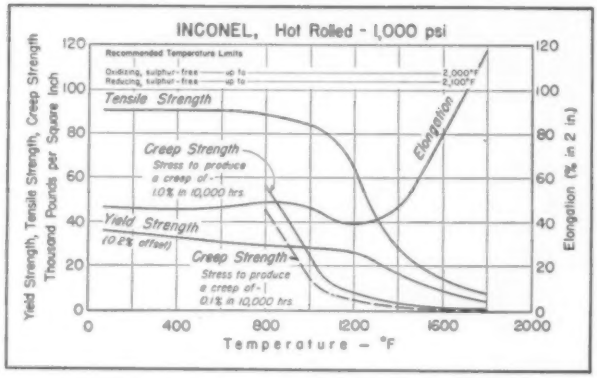
The extremely high temperatures generated within jet and gas-turbine power units are among today's most challenging aircraft engineering problems.

Relatively few materials are able to withstand the destructive combination of high temperatures, corrosive combustion products, and high stresses. Still further complicating the problem... many otherwise satisfactory materials are impractical either because of high cost or inherent lack of workability.

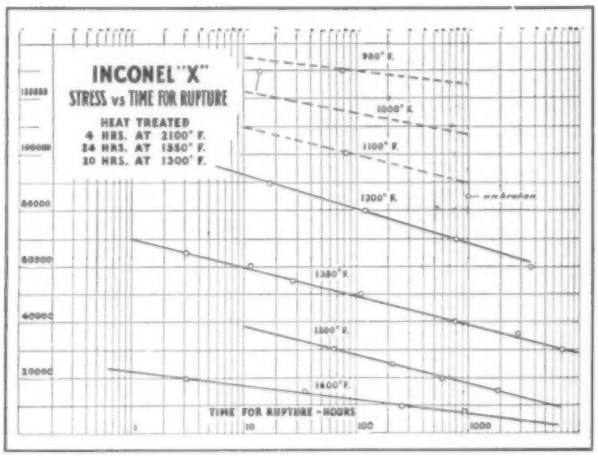
Among the few materials to show satisfactory performance in jet and gas turbine applications are *Inconel*® and *Inconel "X"*®. Both alloys have excellent resistance to corrosion and destructive oxidation at temperatures up to 2000° F. Both alloys are workable. And both alloys are practical in cost.

Inconel serves best where a high degree of oxidation resistance is required and where moderate hot strength is sufficient. Typical applications are—jet burner liners, exhaust systems, heater combustion chambers.

Age-hardenable *Inconel "X"* offers much higher hot strength up to 1500° F, in addition to o ***Free Test*** Stanc... ***Coupon Opposite!***



INCONEL provides an economical answer to high-temperature metal problems where moderate hot strength is adequate.



INCONEL "X" is age-hardenable and offers exceptional mechanical properties as well as high resistance to destructive corrosion.

Write, today, for full engineering infor- ... ut these heat-defying alloys. And ... our Technical Service Department ...ady to help you solve metal-selec- ...brication problems.

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The all-new

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Test 3 . . . test a dozen . . . each pencil of the same degree is always identical! Newly-developed quality controls enable Eberhard Faber to keep every New MICROTOMIC reliably uniform. If you have been annoyed by grade markings that don't mean what they say, try the "3-against-3" test and see why the all-new MICROTOMIC is the drawing pencil of the future.

AS SUPERIOR IN PERFORMANCE AS IS PROMISED IN ITS "NEW LOOK"

New Dusk Gray color chosen by hundreds of draftsmen—distinctly different—less distracting. Quicker to find on any drawing board. New "bullseye" degree markings on 3 sides make it easier to read—never any uncertainty when you reach for a MICROTOMIC.

Sharper prints resulting from HI-DENSITY opaque lines, lines that reproduce dead-white when subjected to the actinic rays of high-speed "printers"—no feathering, no blurry edges! HI-DENSITY leads are stronger too, because of their physical structure—and do away with excess point-crumbling and line smudging.

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New Dynamic Balance Lead Holder. Feather light . . . grips all size leads perfectly. Comes with extra clutch. Color-coded caps identify degrees.

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NOW...*The Better-than-Ever* SUPER 260 NAVION *for* '51

Want the performance thrill of your life? Fly the new, better-than-ever Super 260 *Navion* for 1951! Feel the surging power of the 260-hp Lycoming engine... relax while the *exclusive* inter-connected control system practically flies the 170-mph *Navion* for you. Yes, flying's more fun in the new Super 260 *Navion*. It outcruises, outclimbs, yet lands shorter than other planes in its class. And, for '51—look at these brand new features:

- **NEW...** *More Beautiful Interior Styling*

  Luxurious interiors styled by Charles of California. Beautiful, harmonious colors and fabrics with generous leather trim. Upholstery is extra-thick foam rubber. And the new "reverse flow" ventilating system brings plenty of bracing fresh air into the comfortable, roomy cabin.

- **NEW...** *Exterior Baggage Door*

  The new *Navion Luggage Master* makes baggage a cinch to load and unload. No need to climb in and out of plane while loading... do it all from the outside. Luggage Master is equipped with a sturdy lock for complete protection. Folding rear seat affords easy access to baggage in flight.

- **NEW...** All metal selective pitch Hartzell propeller... push-button starter on the dash board... beautiful, new two-tone exterior enamel finishes... sun-visors and curtains for pilot and passengers.

Ryan Navion

NO OTHER PLANE COMBINES SO MANY FEATURES SO WELL

Rely on Ryan RYAN AERONAUTICAL COMPANY, 401 LINDBERGH FIELD, SAN DIEGO, CALIFORNIA

PROGRESS in miniaturizing radio noise filters is shown. The filter at lower left formerly was used by North American Aviation, Inc. on its machine gun booster. AiResearch has steadily redesigned it until the end result held in the hand. Both units are rated at 25 amp., 100v. dc. New model has been reduced from 4½ cu. in. to 1¾ cu. in.

Radio Noise Filters Made Smaller

Avionic accessories on aircraft create filtering problem; AiResearch has sub-miniaturized line.

The large number of avionic units carried aboard modern aircraft adds to the problem of filtering radio noise. The problem is magnified by the increase in number and sensitivity of radio receivers in civilian and military craft.

For the radios to function effectively, the noise of the electrical accessories must be suppressed efficiently. And this must be accomplished with filters which are as small and light as possible—subminiature units which increase as little as possible the weight of the units to which they are attached.

AiResearch Manufacturing Co. of Los Angeles, a division of the Garrett Corp., was one of the first to delve into this problem and construct a special radio noise testing laboratory.

▶**Dual Problem**—The manufacturers of electrical equipment were faced with the dual problem of building noise filters and shields into the units and reducing their size and weight to the limit.

At Wright Field in 1945 the Air Force concluded that not only must size and weight be reduced greatly, but efficiency of the filters needed vast improvement. Military specifications were accordingly tightened to enforce these improvements. Latest specs call for less than 2.5 microvolts radiated and 50 microvolts conducted.

The same specs increase frequency range for the filters from 20 to 150 megacycles with some of the latest requirements going over 100 megacycles.

To give perspective to the problem, current aircraft receivers can pick up signals whose power is as low as 2 to 3 microvolts in the lower frequency range and 10 microvolts in the higher frequency ranges. Thus, a bare actuator (minus radio noise filtering and shielding) will produce more noise volume in an aircraft receiver than a distant 50,000 watt transmitter.

▶**Midget Filters**—AiResearch has reduced the size of its filters and increased their efficiency by reducing the size of the choke used to build up resistance to the alternating current. Core diameter has been reduced and its impedance boosted many times.

Core used at AiResearch is composed of copper wire hand-wound around a case of molybdenum and Permaloy dust insulated with ceramic dust. The molybdenum and Permaloy is ground to a fine powder—the dimensions of a few millionths of an inch. This is further mixed thoroughly with ceramic dust, pressed and heated to 1000 deg. F. in a hydrogen atmosphere. It emerges as a solid and another ceramic coat is applied.

The advantage of this core material is that each grain is insulated from all other grains. Thus for a small size choke it provides a great deal more impedance than the larger powdered iron cores previously in use.

Its weight and bulk is far less than powdered iron cores. This outweighs the disadvantages of costs—$2 compared to 10 or 15 cents for an equal amount of powdered iron—and the need for hand winding.

On an actuator that will move a load of 2000 lb., the filter weight is only two to three ounces instead of over a pound. And the chokes used give over four times as much impedance as an equal number of turns on a powdered iron core.

▶**Built In**—Most AiResearch radio filters are built into the units. In a few cases they are mounted externally.

AiResearch has also refined techniques of bonding and shielding on mating surfaces by using a gasket of neoprene-impregnated aluminum screen to insure a tight fit. On unexposed surfaces tinned copper is the shielding material.

After all the necessary filtering, shielding, and bonding is completed, the entire unit is checked with a sensitive probe for radiation leaks.

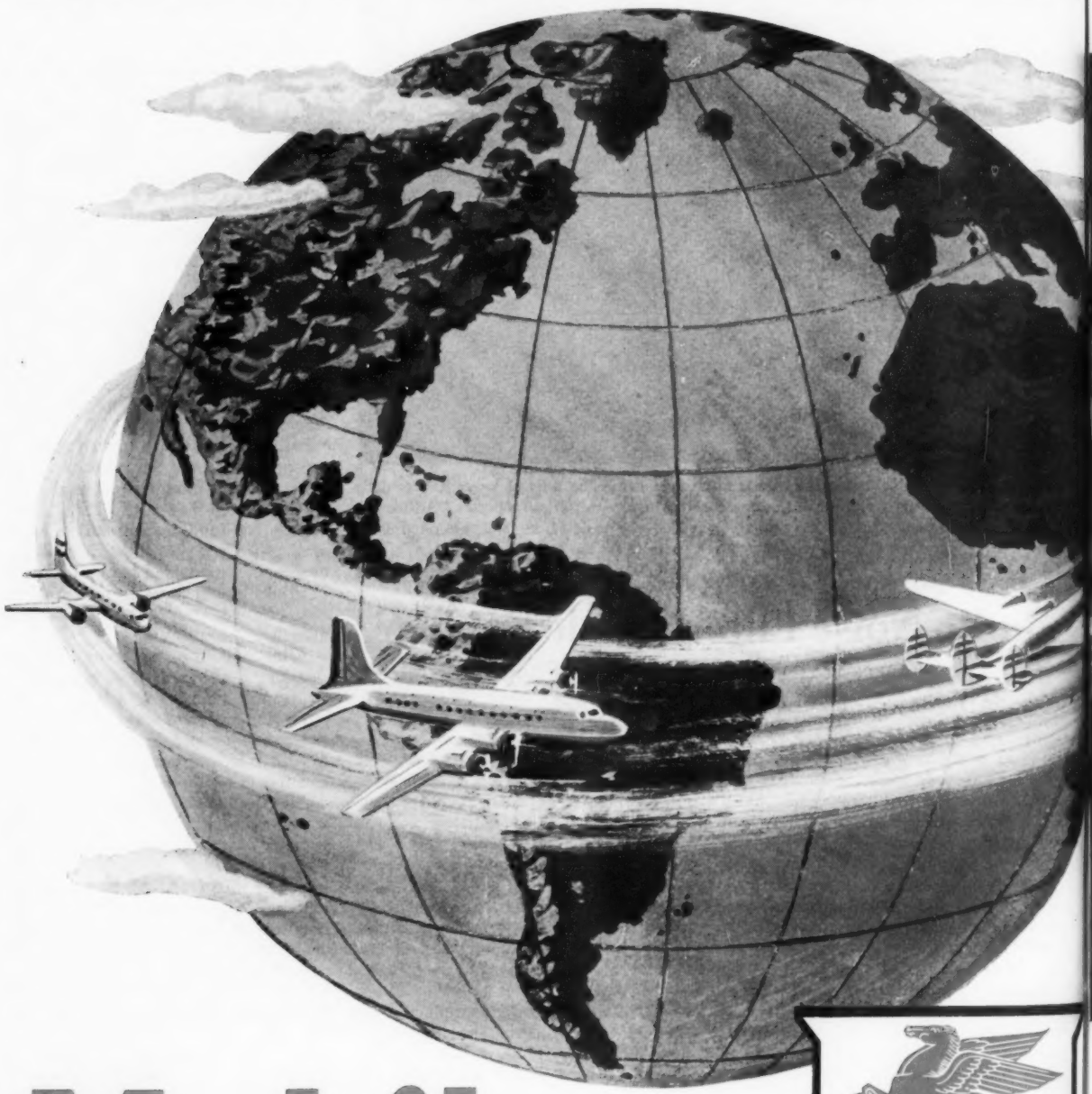
Vent holes in the actuator itself are designed to prevent radio noise from escaping.

All equipment is checked in a radio lab so completely shielded that the strength of signals from a nearby 50,000 watt transmitter are reduced to less than one microvolt. All power entering the building is twice filtered before entrance. Electrostatically shielded transformers are included in the feed-in power circuits.

▶**Goal Is Zero**—Current problem at the AiResearch radio noise lab is to reduce the radio noise factor leak to absolute zero. This requirement probably will be set for long-range guided missiles. The signals to the controlling mechanism must have absolutely no interference. If the noise of the motors within the missiles is not silenced completely, the signals will be received as corrrective measures and throw the missile off course or destroy it.

AiResearch manufactures radio noise filters to these specifications: for electric motors, AN-M-10a, AN-M-40, USAF 32466a, USAF -7274, MIL-1-6181; for electronic systems, AN-1-42.

WHY ACCEPT 4



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Anything LESS?

Famous Flying Red Horse Products have Paced Air Progress Since the Wright Brothers' First Flight!

When the Wright Brothers successfully lifted their crude plane into the air at Kitty Hawk, it was only natural that they should have entrusted the lubrication of their delicate engine to the makers of Mobiloil. This already-famous oil supplier had provided the motor oil for George Selden's first car in 1877 . . . had successfully lubricated Dr. Diesel's first engine in 1898!

Since that first flight in 1903, the makers of Mobiloil have kept pace with every new development in aircraft and engine design. Through constant research, Socony-Vacuum has helped solve the many difficult lubrication problems created by increasingly severe operating conditions.

As a result, Flying Red Horse aviation products today have the approval of every aircraft builder . . . surpass the rigid specifications of the Army and Navy . . . are found at more U. S. airfields—both commercial and private—than the products of any other oil company!

Why accept anything less for *your* plane?

Mobiloil

WORLD'S LARGEST-SELLING MOTOR OIL!

MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

DELTA'S purchasing team. Left to right are: William L. Miller, superintendent of stores; Wade H. Hobbs, assistant purchasing agent and H. D. Wigley, director of procurement.

Airlines Buying More Equipment

Delta's purchases increase 60 percent in three years; mobilization complications anticipated.

New and larger aircraft, and modification of existing planes to greater capacity, have meant higher revenue for airlines, but also higher equipment and supply costs. With some necessary items caught in the mobilization squeeze, costs are expected to go even higher in 1951.

An example is Delta Air Lines, with an efficient purchasing procedure and inventory control. Despite this, Delta officials believe expenditures this year will increase substantially over the $4,888,489 spent in 1950.

▶ **545 Suppliers**—The 1950 purchases were about 60 percent greater than the $3,014,446 total in 1947 (AVIATION WEEK Aug. 30, 1948). The airline buys from 175 suppliers in Atlanta, its home town, and 370 suppliers elsewhere. And it buys in the neighborhood of 50,000 items a year.

Included in its 1950 purchases were $1,545,681 for parts and supplies, $530,574 for engine parts and their repair, $2,387,053 for aviation fuel and oil, and $425,181 for food for passengers. Delta served an equivalent of 639,360 cups of coffee at a cost of $42,624 alone in its food budget.

The company now has in operation 17 DC-3s, 6 DC-4s and 6 DC-6s for passenger service and 3 DC-3s for cargo. Early in January it expects to place into passenger service another DC-6. Just what additional equipment will be needed to handle the expected increase in traffic has not as yet been decided. However, it is agreed that parts and supplies costs will be higher based on higher volume of business and greater utilization of equipment.

▶ **Inventory Control**—All this means that Delta will exercise even greater control in its purchasing program and careful selection and balance in maintaining its inventory.

Delta, as with other air lines, feels that inventory balance and control requires a watchdog procedure. Delta believes that its system of control over more than 40,000 items has operated very effectively and efficiently with a minimum of personnel. There are only seven members of the purchasing department including Mr. Wigley, purchasing agent, and Wade H. Hobbs, his assistant, two buyers, one secretary, one stenographer and one invoice and follow-up clerk.

One factor considered of major importance in this efficiency in the purchasing department is the long service of each employe and familiarity with details and procedures.

At present Delta is carrying an inventory of about $1,785,000, up about 75 percent over 1947 but only slightly higher than a year ago. Efforts have been made to maintain a 60-day stock of general supplies and a 90-day inventory on other items. While turnover is around twice a year, it has been up to three times a year on a large portion of stock. The high turnover factor has enabled the company to keep value of inventory at a minimum level.

Delta officials believe that operations under the national emergency will change a lot of practices, especially with so many items being placed on the critical list. In the past Delta has reworked as many parts as it could in its own maintenance and repair shop. More of this is likely in the future which may mean expansion of shop forces.

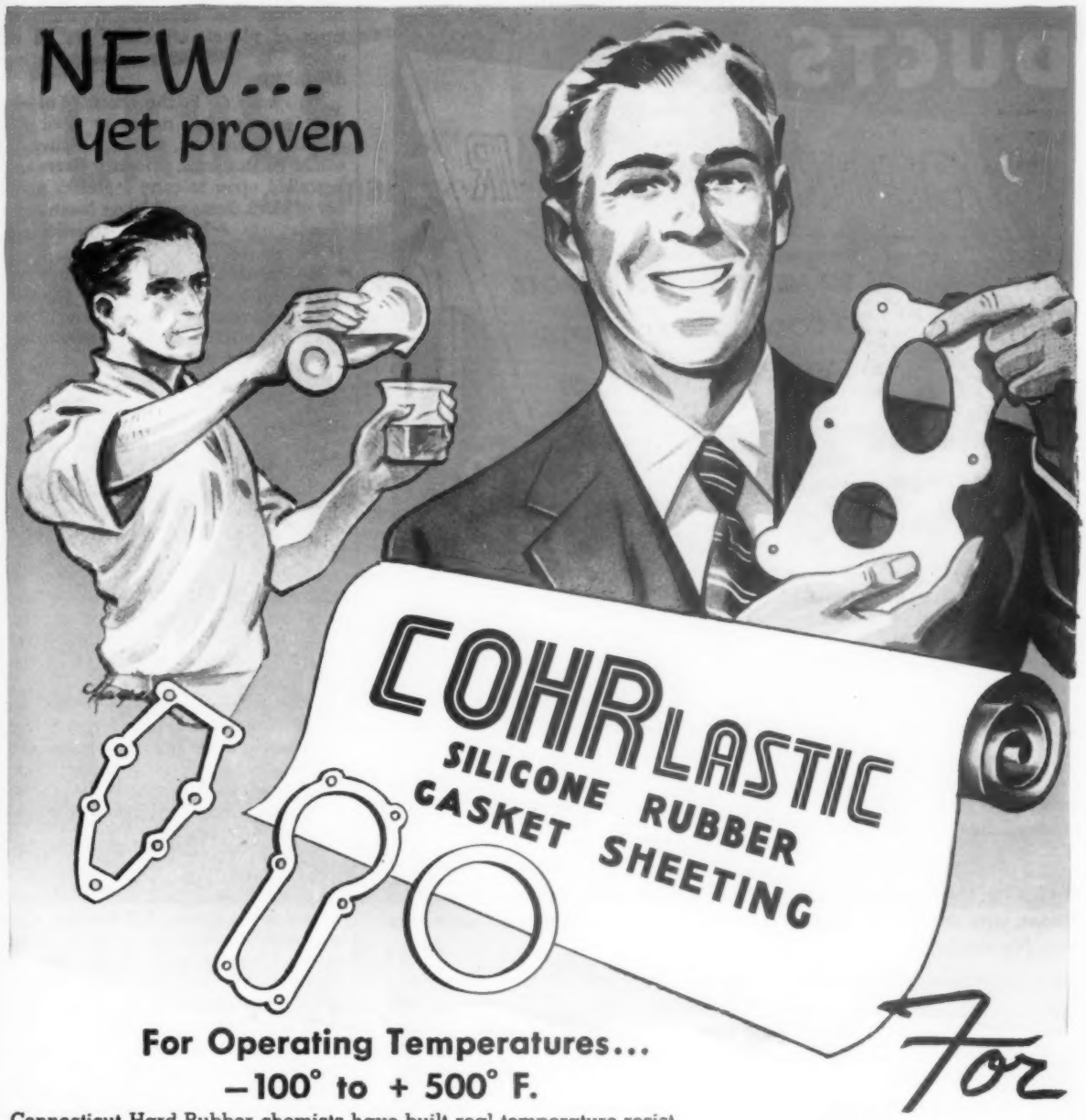
▶ **Supply Difficulties Seen**—While the air lines will operate under the priority system and be assured of needed minimum requirements, Delta officials feel that there will be greater difficulty in securing supplies than was the experience during World War II. This is reasoned on the basis that the Army and the airlines were operating much the same type of equipment. Now the

Joint Purchasing Group

With the country now under a declared national emergency, some airline officials believe strongly that a joint purchasing group and central supplies warehouse is necessary for the industry. This belief which has been held for several years, now is stronger than ever in view of the tightening economy and the difficulties of obtaining priorities.

A joint purchasing agency would enable the airlines better to balance their minimum inventories and at the same time allow manufacturers to plan production requirements well in advance. Delta is believed to be a staunch advocate of such an agency, as its purchasing agent, Horace D. Wigley, is chairman of the Purchasing Committee of the Air Transport Assn.

There is considerable opposition to such a proposal, however. Many airline purchasing men feel they can get better deliveries by direct contact with manufacturers—especially in a period of shortages—because of firm relationships formed in the past. In addition, these men say the joint agency would merely introduce a "middleman," meaning red tape, trans-shipment and the other factors inherent in warehousing.



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We invite you to get acquainted with our highly specialized experience on ducts – engineered for air.

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5-K-13

Air Force has advanced to different types of planes, especially jets all of which is increasing manufacturing difficulties.

This adds up to the necessity of airlines anticipating needs at least six months in advance, although deliveries would be staggered. Manufacturers will be called upon to carry a greater number of stock items and larger inventories if adequate deliveries of supplies are to be assured.

▶ **Modernization**—In anticipating possible difficulties in delivery of supplies and equipment, together with higher passenger traffic, Delta is modernizing all DC-3s and changing from 21 to 25-passenger capacity. The DC-4s have been increased from 44 to 55-passenger capacity.

This modernization was accomplished without installing high density seating, but by utilizing the cabin space.

Interior of the fuselage was rearranged to accommodate the extra seats.

During 1951 Delta anticipates an increase of about 20 percent in business, based on the present equipment plus the one additional DC-6. It further anticipates an increase of 15 percent in utilization of aircraft.

During 1950 passenger traffic ran about 16 percent over the year before. Increases in other phases of traffic were also shown as follows: passenger miles, 30 percent; air mail pounds, 20 percent; air express pounds, 43 percent, and air freight, 62 percent.

Several factors favor much higher traffic to and from the Southeast. The area has enjoyed great industrialization—there is the former Bell bomber plant at nearby Marietta soon to be reactivated, Chase Aircraft is to move to Birmingham and the new H-bomb project near Augusta, all adding up to more air traffic.

And with this prospect, Delta officials say they will be watching even closer their purchases and maintenance of inventory control. All of this careful planning is one factor which enabled Delta to show a profit of around $800,000 for 1950, figuring the excess profit tax, as compared with a profit of $422,588 in 1949.

▶ **Where Money Went**—The following table shows the airline's purchases during 1950:

Engine parts	
A. (1) 1820 (Wright)	$43,144
(2) R-2000 (P & W)	137,584
(3) R-2800 (P & W)	241,117
B. Outside repairs to engine parts	108,729
Airframe parts	90,504
Aircraft window glass	3147
Control surfaces	30,000
Landing gear	10,000
Aircraft wheels	23,220
Aircraft brakes	45,000
Shock struts	15,000
Retract struts	5000
Superchargers	84,000

Illustrated are an 8½" bellows used in jet aircraft engines and a ½" bellows suitable for instruments.

There is a CMH Stainless Steel Bellows to meet every aircraft requirement

Although CMH manufactures bellows of greater diameter than the larger of the two illustrated above, this photograph conveys the wide size range in which CMH Bellows are available. Whatever the size—½" and up—CMH Bellows are precision made to meet the most exacting requirements. Advanced manufacturing methods permit the forming of most types as standard production items with the obvious advantages of greater uniformity and lower cost.

Whatever your bellows needs, inquire about CMH Stainless Steel Bellows. Write for complete information.

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AERO DIGEST	642
AMERICAN AVIATION	614
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†Representing the *largest page increase* of any Aeronautical publication for the 12 months of 1950

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MEMBER ABC AND ABP

** BASED ON 23 INDEPENDENT READER PREFERENCE STUDIES*

• Source: Aviation Week Research

Refrigerating equipment (aircraft)	9357
Hydraulic system	8000
Interior seats	13,764
Upholstery material	25,000
Seat belts	5000
Oil coolers	6715
Engine mounts	7000
Aircraft landing lights	5708
Mechanics & porters uniforms	5643
Pilots, stewardess & agents uniforms	52,743
Spark plugs	18,600
Linoleum and masonite	6500
Lumber	8500
Aluminum	25,000
Copper	4000
Steel	10,000
Brass	2000
Plastics	10,000
Textiles	22,000
Printing	21,000
Stationery	7179
Aircraft tires & tubes	72,488
Automotive tires & tubes	3000
Plating supplies	2545
Office equipment & supplies	99,438
Batteries (aircraft & ground starting)	5000
Flashlight batteries	5460
Paints, varnish, lacquer & thinner	10,000
Teletype paper	12,000
Radio equipment (including tubes)	
DC-3 aircraft	12,177
DC-4 aircraft	42,095
DC-6 aircraft	42,248
Ground radio	30,871
Laundry	5000
Aircraft rug material	14,000
Schedule folders	23,654
Ignition harness	10,400
Magneto parts	14,466
Starter parts	19,083
Generator parts	26,493
Carburetor parts	39,024
Fuel pump parts	5000
Instruments (flight)	10,000
Instrument parts (flight)	15,000
Electrical supplies—including fluorescent & incandescent tubes	33,023
Repairs to fire extinguisher—including recharging	832
Grinding discs & wheel	1000
Sand paper & abrasives	2720
Mill supplies	10,000
Shop equipment	45,000
Hand tools	15,000
Ground equipment	30,631
Propeller parts	
DC-3	5429
DC-4	10,132
DC-6	33,731
Masking tape	6000
Engine cleaning compounds	10,000
Mineral spirits	12,000
Chemicals	23,147
Valves	750
Distilled water	100
Deicer boots	16,600
Aircraft bolts	25,000
Aircraft screws	20,000
Aircraft nuts	25,000
AN fittings	40,000
Bearings	8500
Acetylene, oxygen and compressed air	500
Typewriter repairs	750
Janitor supplies	5000
Soap for rest rooms	2000
Toilet tissue and towels	3000
Surgical supplies	500
Shipping supplies	1501
Commissary equipment	2116
Electric motor repairs	340
Plumbing supplies (building)	1190
Flowers	756
Photographic supplies	5000
Business cards	3166
Motor vehicle parts & repairs	2482
Castings	315
Sporting goods	300
Food for passengers (Includes 106,560 qts. coffee @ 40¢ qt.; Total $42,624—equal to 639,360 cups)	425,181
Aviation gasoline	2,324,653
Aviation engine oil	62,400
Miscellaneous (not otherwise classified)	43,147
	$4,888,489

AT YOUR FINGERTIPS →

ALL CIVIL AVIATION VHF COMMUNICATIONS FREQUENCIES!

Here is the control of the POWERFUL new Bendix TA-18 VHF Transmitter. Used with the MN-85 receiver, a part of the famous Bendix NA-3 VHF Navigation System, it enables you to select any channel between 118 and 136 mc. by simply rotating a pair of concentric control knobs until the EXACT frequency in megacycles is indicated. With the MN-85 receiver there is no need to call the tower for lengthy test "counts" or tuning back and forth to insure good reception. You're *sure* of good solid contacts every time, because the TA-18 delivers an honest 25 watts or more on all frequencies within its range. All 180 channels are there, crystal-controlled by the Bendix "crystal-saver" system which requires only the 28 crystals that are shipped in the equipment. No more to buy. So if you want to be always "LOUD and CLEAR" and "FULLY EQUIPPED" send for further details on Bendix Radio's latest aid to safe, practical air navigation.

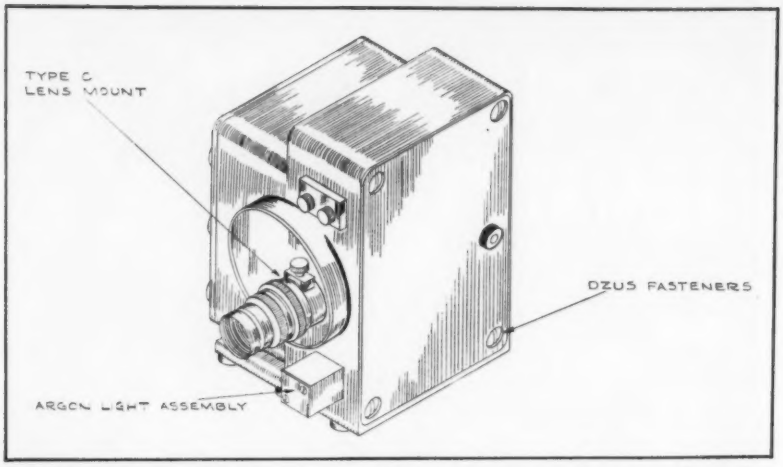
VHF Transmitters • H. F. Transmitters • Radio Control Panels • Antennas • Indicators • Automatic Radio Compasses • Marker Beacon Receivers • Announcing Systems • VHF Communication and Navigation Receivers • Inter-Communication Systems • H. F. Receivers • Radio-Magnetic Indicators • Ground Controlled Approach Landing Systems • Flightweight Personal Plane Radios • VHF Omni-Directional Range Systems

Whatever the Plane or Purpose...

Bendix Radio is the Choice

BENDIX RADIO DIVISION of Bendix AVIATION CORPORATION
BALTIMORE, MARYLAND

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York



SKETCH showing configuration of new synchronous camera recently put on the market.

Versatility Feature of New Camera

Flight Research Engineering Corp. producing 35-mm. unit for flight testing, many other applications.

A new 35-mm. synchronous camera capable of maintaining one millisecond shutter accuracy has just been announced by Flight Research Engineering Corp., Richmond, Va.

This latest development, labeled the Model IV, 35-mm. Synchronous Motion Picture Camera, follows the Model III 16 mm. camera which has been used extensively by both Air Force and Naval test facilities in evaluating test equipment according to the manufacturer.

The Model IV unit, designed primarily for flight testing, missile tracking, fire control and bomb spotting application, can take either single-frame or continuous exposures. Additional uses; wide base stereographic photography and process control analysis.

The synchronous control mechanism, on which patents are pending, maintains all shutters of cameras in a parallel operated gang within a maximum divergence of 5 deg. This is equivalent to 1/700th sec. at a film speed of ten frames per sec. A silver drum capstan clutch, actuated by a special circuit keeps any one camera from gaining or losing a frame in a sequence.

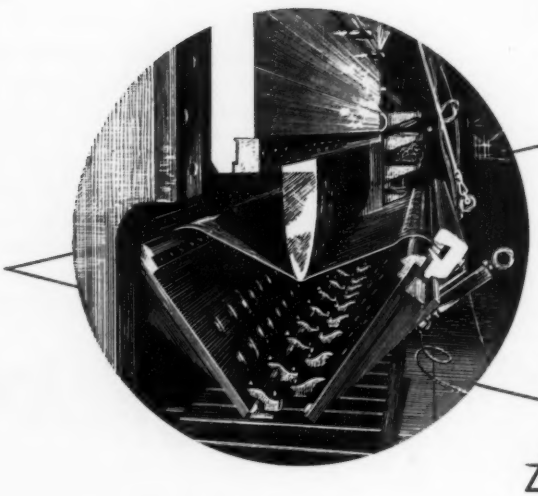
Any camera in a gang may be used as a "master," the others as "slaves." Provisions are made for synchronizing cameras by a simple single channel radio link, should the units be places at distant points.

The mounting pads, aligned with the optical axis of the camera, are machined accurately enough to permit interchanging units without disturbing their original alignment.

▶ **Versatility**—The Model IV, which the manufacturer believes to be the only 35-mm. synchronous camera on the market, is interesting because of the diverse applications to which it may be put, including, for example, oscillograph photography.

Fast Way to Build Fast Fighters!

Special press devised by Northrop cuts production time on single operation for wing leading edges from 8 hours to 2 minutes.



Hours saved by special manufacturing techniques at Northrop mean faster delivery of all-weather Scorpion F-89 interceptors for our country's defense. These speedy, heavily-armed U. S. Air Force F-89's, with electronic search equipment, are worthy successors to the hundreds of deadly P-61 Black Widows built at Northrop during World War II.

NORTHROP

Pioneer Builders

• **Flight testing.** One or more cameras may be used to photograph flight and engine instruments while others simultaneously record the plane's attitude by photographing the horizon.

• **Missile tracking.** Path of an in-flight missile may be recorded with an accuracy of one foot in a thousand, Flight Research says.

Two or more units remotely placed and synchronized, permit accurate determination (by triangulation) of missile position as a function of time. The precisely located *reference* markers permit detection of tracking errors of better than one gunnery mil by taking measurements on a projected picture.

• **Airborne fire control** system evaluation. Thorough evaluation of an airborne fire control system and its operating personnel may be achieved with this set-up: mount cameras to record simultaneously the bomber's horizon (to determine attitude), photograph along the gun's bore, photograph along the director axis and along the flight axis of the "target fighter." In this case, fighter and bomber cameras would be synchronized by radio.

• **Bomb spotting.** By simultaneously photographing bomb sight, flight and bombing instruments and target area, bombing errors and their cause may be determined says the manufacturer. Timing or argon lights may be used to mark all films at the exact time of bomb release.

► **Design Features**—Among many features of the Model IV listed by Flight Research are:

• **Frame speeds** of 5, 10 and 20 frames per second. Other speeds such as 4, 8, and 16 can be supplied. Standard exposures are 1/50th, 1/100th and 1/200th sec. at 5, 10 and 20 fps., respectively.

• **Film chamber** capacity is 100 ft. of film rolled on daylight loading spools.

• **Frame counter** is visible from the rear of the case shows exact number of frames exposed since the camera was last reset.

• **Temperature and altitude** conditions. Model IV is designed to operate at temperatures from —55 to +75 deg. C., humidity up to 100 percent and to 60,000 ft. altitudes. Thermostatic control prevents the film chamber from getting below 0 deg. C.

• **Coding and timing lights.** Coding film sequences and indicating time intervals on the film is accomplished by a General Electric removable 323 light. For marking extremely short intervals or higher frequencies, an argon lamp is provided.

• **Boresighting tools** are provided to enable operators to bore-sight the cameras or their mounting stands with great accuracy.

• **Lenses.** Mount will accommodate any lens designed for a Bell & Howell Type C mount.

• **Power supply.** The 1/100-hp. synchronous motor used in the Model IV requires 50 watts, three-phase 115 v., 400 cps. The clutch and heater circuits operate on 30w. at 28v. dc. Coding and timing lamps require 1.5 to 3v. dc. Argon lamp is wired in series with a 15,000-ohm resistor and fires at less than 115v.

Flight Research Engineering Corp. believes that the Model IV camera will serve a useful purpose in the current preparedness program.

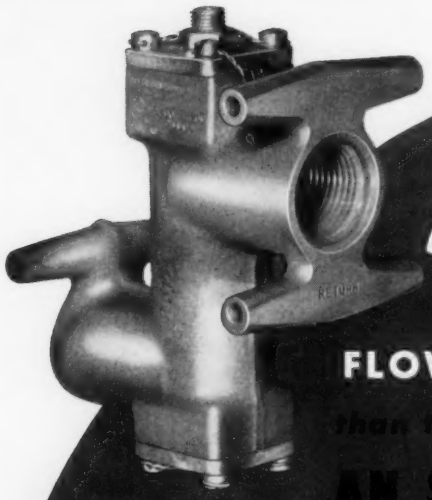
O-Rings for Jets

Completion of molds and build-up of service stocks of O-rings in all of the 101 new sizes recently added to Specification AF 934 has been announced by Parker Appliance Co.

The new additions bring to 189 the number of sizes now carried by the company as AF 934 standard stock items. These O-rings fully comply with the critical fuel-resistant requirements of MIL-P-5315, Parker says. They are molded of a special compound especially suited to either static or dynamic service in sealing components in jet fuel systems and auxiliary installations.

AIRCRAFT, Inc., Hawthorne, Calif.

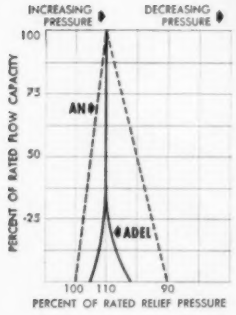
of Night and All-Weather Fighters



100% to 400%
GREATER
FLOW CAPACITIES
than those required by
AN STANDARDS!

ADEL 3000 PSI POPPET type RELIEF VALVES

¼", ⅜" & ½" line sizes are QPL equipment per MIL-V-5523



For complete engineering specifications and counsel, address: ADEL DIVISION, GENERAL METALS CORPORATION, 10775 Van Owen St., Burbank, Calif.

FLOW CAPACITY DATA (gpm)

	LINE SIZE			
	¼"	⅜"	½"	¾"
AN Standard	1.2	3.5	6	16
ADEL	**6**	**10**	**14**	**32**

ADEL 3,000 psi Class CD poppet type relief valves provide maximum flow capacity for a given line size. All conform strictly to AN 6279 Envelope. Extremely compact, light weight construction permits savings in weight of up to twice that of competitive valves. Zero internal leakage requirements are met at a pressure 30 psi less than dynamic cracking pressure, and 30 psi less than dynamic reseating pressure as defined by MIL-V-5523. Pressure variation from cracking point to maximum rated capacity is far less than that required by AN standards.

Make comparisons and see for yourself why these outstanding valves are unexcelled for high pressure aviation hydraulic performance.

ADEL also produces the most complete line of AN Standard aircraft Clips and Clamps available.

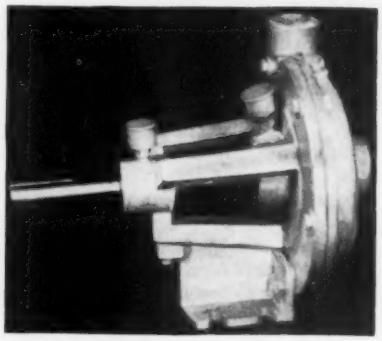
ADEL LEADER IN HYDRAULICS

Manufacturers of Aircraft Hydraulic Control Equipment

DIVISION OF GENERAL METALS CORPORATION • BURBANK, CALIF. • HUNTINGTON, W. VA.

CANADIAN REP.: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

NEW AVIATION PRODUCTS



Aerial Spray Pump

An improved Simplex pump, used for aerial spraying, which combines the features of non-leak operation and longer life, is being offered by Columbia Exporters, Inc.

Previously, a tight packing seal could be used to prevent pump leakage, but it also reduced pump life through active wear on the shaft. Now a mechanical seal, eliminating the bothersome packing gland and need of constant adjustment, has been incorporated in the unit.

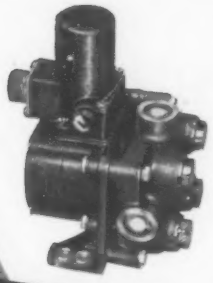
The mechanical seal is located back of the rear bearing and consists of a synthetic rubber gasket housed in a cadmium-plated case. It is held against the shaft by a copper spring. The new one-inch pump has ball bearings at one end of the shaft and a Timken thrust bearing on the other end. Smaller capacity pumps using ball bearings at both ends of the shaft also are available. Address: 1105 SE Morrison St., Portland, Ore.

Radio Compass Dials

A line of dual radio compass indicators has been scheduled for manufacture early this year by Aviation Accessories, Inc.

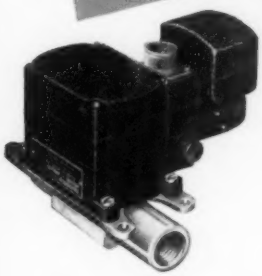
The Ft. Worth company plans to turn out a large unit, ADF-50, and a smaller version of this, the ADF-52.

LOOK TO *Bendix-Pacific* FOR ELECTRO-HYDRAULIC EQUIPMENT

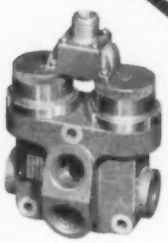


Bendix-Pacific Geneva-Loc Operated Valves offer the combined advantages of two proven items—Bendix-Pacific manually operated AN type 4-way Valves and the Bendix-Pacific adjustment-free Geneva-Loc actuator. Over 40,000 valves and 20,000 actuators are now in service.

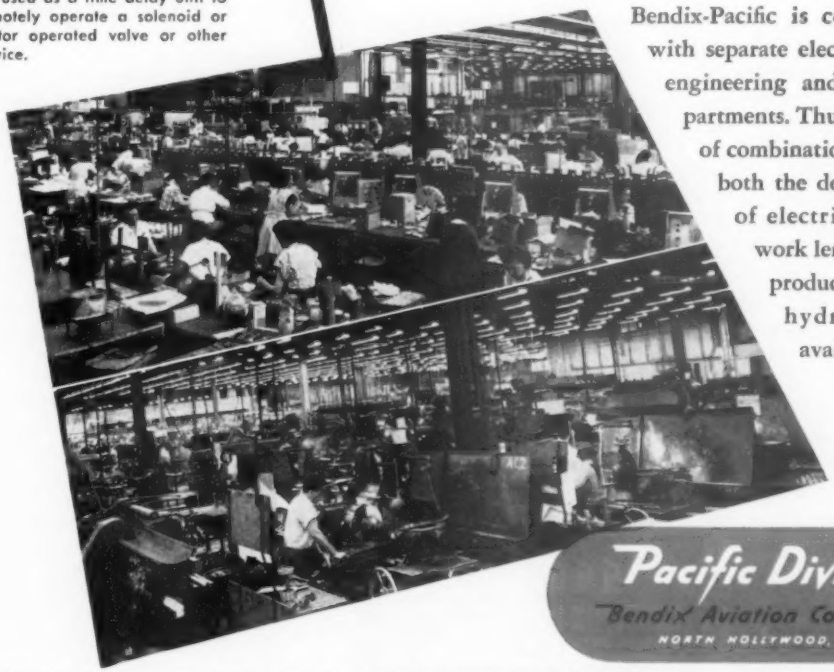
Bendix-Pacific Power Units—This Electro-Hydraulic Power Unit is a complete, independent power system located where the work is done. Developed by Pacific Division engineers to meet requirements of large aircraft, the unit offers the power *transmission and control* advantages of electricity and the power *application* advantages of hydraulics. First developed for the C-97 airplane cargo door, these systems have been used almost without change or service troubles since the airplane was introduced.



Time Delay Valves—These units automatically reset themselves at any time the circuit to the actuator is open and then re-established. The unit is adjustable to provide for any desired time delay between closing of the circuit and shutting off of the valve. Also, the actuator can be used as a time delay unit to remotely operate a solenoid or motor operated valve or other device.



Solenoid Operated Valves—Bendix-Pacific makes many types of solenoid operated valves. Shown is the new trail-type solenoid operated hydraulic 4-way valves for applications requiring the cylinder ports to be open to return in the neutral position. The valves operate at speeds up to 5/100 second with low current drain and without electrical holding coils or switches.



Bendix-Pacific is completely equipped with separate electronic and hydraulic engineering and manufacturing departments. Thus, in the manufacture of combination units, specialists in both the design and production of electrical and mechanical work lend their full talents to producing the finest electro-hydraulic equipment available.

Bendix

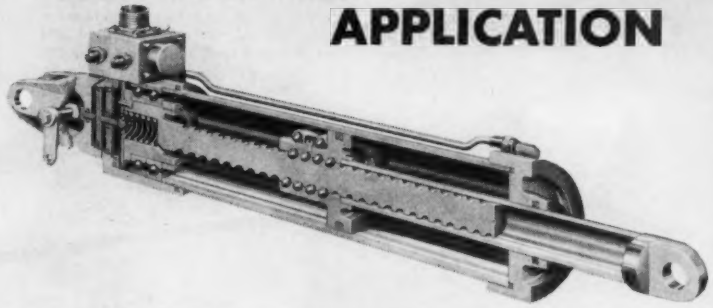
Pacific Division

Bendix Aviation Corporation

NORTH HOLLYWOOD, CALIF

East Coast Office: 475 Fifth Ave., New York 17 • Export Division: Bendix International, 72 Fifth Ave., New York 11 • Canadian Distrib.: Aviation Electric, Ltd., Montreal

NEW BALL BEARING SCREW APPLICATION



New Aircraft Actuator Uses Saginaw Ball Nut Screw

This advanced, hydraulic aircraft actuator owes its efficiency and lightweight to its quick-acting Saginaw ball bearing screw and nut. It operates satisfactorily under extremely high loads . . . features emergency power drives and synchronization for two or more units. In the event of system failure, a mechanical brake locks the actuator. Stroke and thrust are limited only by available flow and pressures.

Numbers show electro-mechanical actuator installations on Banshee jet fighter for (1) main landing gear door, (2) main landing gear, (3) wing fold, and (4) nose landing gear. Operating loads run from 1800 lbs. to 14,000 lbs. Strokes range from 8.4 in. to 19.53 in. All installations use Saginaw's friction-free ball bearing screw and nut.

FRICTION-FREE PRINCIPLE NOW AVAILABLE FOR UNLIMITED USES

The friction-free operation of the Saginaw ball bearing screw and nut brings new efficiency to numberless industrial operations. In many cases actuating efficiency is increased more than 90 per cent, while operating costs are reduced as much as two-thirds.

The Saginaw ball bearing screw and nut makes possible the use of smaller motor drives with less horsepower. It permits faster operation with less heat generated, and allows rapid forward or reverse action with minimum wear and friction. Compact design for simple lubrication; remarkably low maintenance.

SAGINAW DESIGNS EACH APPLICATION TO SPECIAL ORDER

Each application is treated as an individual design; Saginaw makes no off-the-shelf sales. Manufacturing facilities are geared to meet any desired production rate — large or small — and deliveries are scheduled to meet customer requirements.

Saginaw puts 38 years of gear building experience behind every product it makes; has one of the largest and most highly trained staffs of engineering, designing and manufacturing gear specialists in the country.

INSTALLATIONS FOR BALL BEARING SCREWS COVER EVERY FIELD OF INDUSTRY

Present industries using the product include aircraft, machine tool, automotive, farm machinery, boat building. It is widely employed in truck trailers, adjustable beds, lifting jacks and countless other actuating devices. Complete engineering facilities are available to give prompt attention to customer problems.

Saginaw

STEERING GEAR DIVISION

General Motors Corporation, Saginaw, Michigan

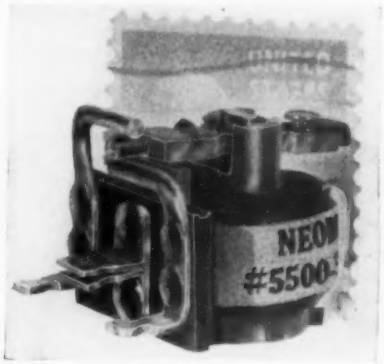
SSG PRODUCTS

STEERING GEARS AND LINKAGES • PROPELLER SHAFTS • TRANSMISSION CONTROLS • TURN SIGNALS • DIESEL ENGINE PARTS • BALL BEARING SCREW AND NUT ASSEMBLIES • AUTOMOBILE JACKS

The ADF-50 is a 5-in. dual indicator designed specifically for red and green ADF receivers.

The ADF-50 carries CAA certificate number 4R4-2, the maker says, and features a rotatable azimuth scale which can be adjusted by a small knob to either the magnetic or true scale as desired by the operator. The indicator has a fluorescent dial with a red and green pointer.

The smaller ADF-52, carrying CAA type certificate number 4R4-4, has a standard 2⅞-in. dial and does not incorporate the rotatable azimuth scale. Both models are priced at $225 f.o.b., Fort Worth. Address: PO Box 4178, Ft. Worth 6, Texas.



Tiny Relays

Substantiating the seeming contradiction that while many types of aircraft are becoming larger, many of the components used in them are getting smaller, Neomatic, Inc. has placed on the aviation equipment counter a line of relays not even large enough to cover a postage stamp.

Designed to meet exacting space and performance requirements in aircraft, guided missiles and other airborne equipment in which more and more avionic components are being crowded to meet increasingly stringent and complex flight demands, these relays weigh less than ½ oz.; are built to withstand high vibration and acceleration forces. Designated Series M, they also will be available shortly in hermetically-sealed containers for protection against pressure and temperature variations, dust and other conditions.

Series M relays are built to stand up under 20 G vibration and more than 50 G acceleration in any direction, without affecting contact position. The coil is universal-wound and vacuum impregnated. Precision adjustment of operating value is provided and mounting is accomplished with one 2-50 screw and an extruded locating pin which maintains alignment. Model 5500, shown above, is an SPDT type rated at 5000 ohms, 72v. d.c. Address: 879 Wellesley Ave., Los Angeles 49, Calif.

ALSO ON THE MARKET

Di-Acro Vari-O-Speed Powershear can be used for continuous or single-stroke operation for precision cutting of soft to very hard materials. Both "gradual" or "impact" shearing can be performed. Cutting cycle can be adjusted as desired through 30 to 200 rpm. speed range. With 16 gauge sheet-steel capacity and available in 12 and 24-in. models, unit is made by O'Neil-Irwin Mfg. Co., Lake City, Minn.

Portable, wheeled dry chemical fire extinguisher with 150-lb. powder capacity for fighting Class B and Class C fires too severe for 20 to 30-lb. extinguishers can be adjusted to "fan" or "straight" discharge, has 50-ft. heavy duty hose. Made by Walter Kidde & Co., Inc., Belleville, N. J.

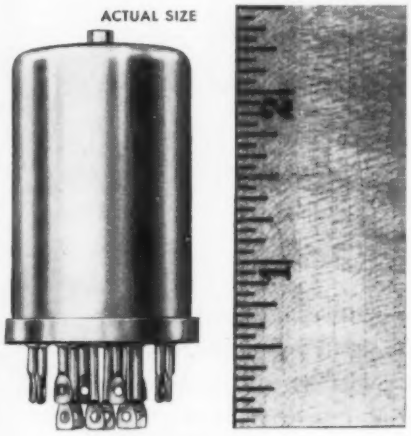
Improved quick change gear mechanism for 14½ and 16-in. swing lathes made by South Bend Lathe Works requires less power, is sturdier and simpler than previous models. Has conveniently placed tumbler levers, no sliding clutches or sliding primary end gears to change. Made by South Bend Lathe Works, South Bend 22, Ind.

A New Advance IN HERMETICALLY SEALED, MINIATURE

Aircraft Type Relays

by "Diamond H"

ACTUAL SIZE



Basic Data

4 POLE DOUBLE THROW

SIZE: *smallest of its type, 1.5 cubic inches*

WEIGHT: *lightest of its type, 3.5 ounces*

SHOCK RESTRICTION (operating): *greatest of its type, 50 G.*

TEMPERATURE RANGE: *widest of its type, −65° C. to +200° C.*

Plus these other important specifications:

1. **Contact Rating:** 2A, 28V, D.C.; 2A, 115V, A.C., 400 cycle.
2. **Contact Overload Rating:** 12A, 28V, 20 sec.
3. **Altitude Rating:** Dry, inert gas, pressure filled; hermetically sealed.
4. **Coil Resistance:** 50 to 10,000 ohms.
5. **Coil Voltage:** 18 to 250V, D.C.
6. **Terminal Arrangement:** soldered connections; plug-in optional.
7. **Mounting:** Variable.
8. **Variations:** Virtually innumerable, in voltage, amperage, number of poles (4 maximum) and temperatures.

To meet exacting requirements of missiles, rockets and other air, ground, and marine applications, this new relay incorporates a hitherto unmatched combination of characteristics. The combination is achieved through several unique design features developed by The Hart Manufacturing Company, producer of dependable electrical controls and devices for more than half a century.

Write today for complete information on this new relay. We'll gladly work with you to develop any special variation to meet your specific need.

The Hart Mfg. Co.
215 Bartholomew Ave.
Hartford, Conn.

Send me further information about your new relay.

Name _____

Title _____

Company _____

Street _____

City _____ *State* _____

point your operations toward revenue

Two 10-ship Mul-T Hangars by International Steel bring revenue to the Bishop Airport, Flint, Michigan.

Airport managers from coast to coast are finding "pay space" in International Steel Aviation Buildings — space bringing in income to help reduce operating costs.

International Aviation Buildings uses are many. They furnish space for rental to plane owners, for rental of offices. They provide housing for equipment, for restaurants, for storage of cargo, for repair shops.

You'll also find that International Aviation Buildings are economical . . . profitable — can be amortized quickly — and bring in welcome income.

Write today — International engineers can help you.

HANGAR DIVISION

INTERNATIONAL STEEL CO.

1802 EDGAR ST. • EVANSVILLE 7, IND.

IN THE AIR...

You're always right with AUTO-LITE

AIRCRAFT WIRE AND CABLE

You are invited to write for our informative catalog.

IF IT'S quality you're after—if its quantity you want —if it's a special specification you need, Auto-Lite has the answer. In 39 years' experience, Auto-Lite research and advanced laboratory skills have assisted leading aircraft manufacturers in meeting difficult wire and cable problems. Today, the tremendous output of the new Hazleton plant, combined with the now increased facilities at the Auto-Lite Port Huron plant, makes it possible to accept additional aircraft wire and cable business. Money cannot buy better wire and cable.

THE ELECTRIC AUTO-LITE COMPANY
Wire and Cable Division
Port Huron, Michigan Hazleton, Pennsylvania

AUTO-LITE MEANS PRECISION MANUFACTURING

LOW TENSION

Aircraft Low Tension Cable Specification AN-JC-48a. Aircraft Low Tension Cable shielded Specification ANC-168.

Aircraft Low Tension Cable aluminum conductor Specification ANC-161.

HIGH TENSION

Aircraft High Tension Ignition Cable sizes 5MM, 7MM and 9MM Specification ANC-130a, also to commercial standards.

Magnet wire to Specification JAN-W-583 and commercial standards.

SALES & SERVICE

ONE FOOT ON GROUND is symbolic as Nyrop hands first roadable certificate to Fulton.

Army Interest in Airphibian Seen

The Army could make good use of the Fulton Airphibian, newly certificated roadable plane (AVIATION WEEK Jan. 1), according to its designer, Robert Edison Fulton, Jr. Possible use would be for special liaison, transportation of key officers, and other places where combination of air and surface travel may be desirable.

In addition to orders for a dozen Airphibians from India and CAA indication that it might use the roadable craft for travel by its agents, Fulton claims that a Texas dealer says he can sell all the planes Fulton can make.

Roadable plane enthusiasts say the certification is the biggest step in the lightplane field in years. Now an air traveler can land his Airphibian at the airport, detach the car from the flight component, and drive the car down the highway at speeds up to 50 mph.

▶**Production Troubles?** — Materials shortages probably will not affect Airphibian production on early orders. Fulton has the tools and dies at his Danbury plant for special parts machining.

Fulton is said to be backed by enough money to produce the plane in quantity if the public wants it.

▶**Competition**—Right now, Fulton has the only certificated vehicle that offers combination air and ground travel.

But at least two other advanced type airplanes are looking for certification in the future. The Koppen-Bollinger Helioplane has no automobile attachment but it has the advantage of extremely short runway requirements and low stall speed, so it can get into small cornpatches, etc. The Moulton Taylor Aerocar is roadable and carries its wings with it on the road. These two also are expected to get rental encouragement from CAA, if and when they are certificated.

▶**Price**—Fulton says his Airphibian will sell for under $10,000. A lot depends on quantity of orders, on materials prices and availability, and on production technique and labor.

Weak Eyes Do Not Mean Poor Pilots

Pilots with deficient eyesight are just as safe as those with near-perfect vision, according to an analysis of pilot records by the Committee on Aviation Psychology of the National Research Council.

Prepared for the Civil Aeronautics Administration, this finding should help private plane salesmen sell more planes; it should also permit the military to concentrate more on brains and psychological stability of pilot applicants, rather than on physical attributes.

The study shows that although sub-CAA-standard pilots may learn more slowly, they have just as good safety records as do those who can meet the CAA standards.

The weak-eyed pilot group analysed had done the same amount of flying as the good-eye group. This is the first study of its kind in which the accident exposure rates (amount and type of flying done) for each group was known. This is probably therefore the first apparently valid analysis of the relation between pilot eyesight and pilot performance.

Most CAA rejections of applicants for pilot certificates have been due to bad eyes.

"The findings of this report should do much to allay the concern which has been expressed in some quarters with respect to the CAA policy of permitting individuals with defective vision to qualify for the private flight certificate," the authors state.

The study was conducted by David Bakan and E. S. Ewart. Their report is published as No. 94 of the CAA Division of Research. The survey covered the records of 194 pilots divided in three groups: normal vision, vision corrected to normal by glasses, and deficient vision not necessarily correctible to normal with glasses.

Many potential private and commercial pilots have failed to go into aviation either because they were rejected or because they thought near-perfect vision was necessary for safe flying.

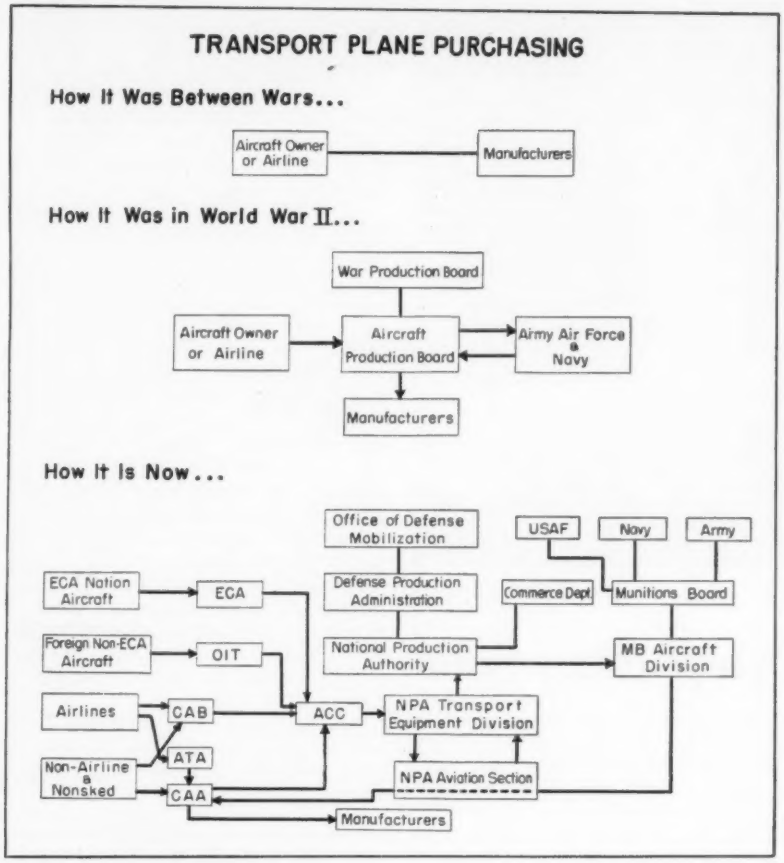
And the Navy and Air Force have found themselves severely limited in pilot selection because they demand natural 20-20 vision.

BRIEFING FOR DEALERS AND DISTRIBUTORS

▶**Taloa Expands**—Taloa Academy of Aeronautics, Oakland, has taken over the nearly 20-yr.-old Moreau Flying Service based in Hangar 2 of Oakland Airport. The deal covered a fleet of eight planes and extensive maintenance equipment. Taloa, a division of Transocean Air Lines, recently was awarded a contract by the Republic of Indonesia to train 60 aviation officers.

▶**Private Fields Up**—Privately-owned airports have increased to 1167, compared with 900 last year, with Texas leading all states (635), California being second with 525 and New York third with 261. National totals show 6449 civil and military fields, according to CAA.

▶**Flight Operators Surveyed**—Activities of 137 fixed base operators at 87 Washington State airports were scrutinized by CAA to study their possible roles during mobilization. The operators were found to have 675 planes, 376 pilots, 215 E&A mechanics and 260 other employes.



Priority Plan Complex But Clearing

CAA now issues ratings, but newer proposal of ACC is the government's first step toward World War II system.

By F. Lee Moore

Priorities should have reached manufacturers last week for 197 new transport planes and parts ordered up to Nov. 2, 1950. Meanwhile, government agency wheels are spinning and sputtering as Air Coordinating Committee pushes plans to mesh civil and military plane priorities, materials scheduling, and manufacture.

▶ **Channels for Priorities**—ACC has announced its recommendation of channels for getting essential civil aircraft built and maintained. This ACC scheme appears complex, but it actually is the first step toward a semi-independent aircraft production board like the one in World War II. Once ACC gets its recommendation approved by Defense Production Administration, if it does, there will be some streamlining that will reveal this trend toward an ACC-sponsored aircraft production administration or board reporting directly to the Defense Production Administration.

DO defense order priorities signed by the Civil Aeronautics Administration give civil aircraft and spares equal priority with the military.

In case of priorities conflict on scheduling of production and delivery, National Production Authority and the Munitions Board now decide who gets first call. But ACC hopes to be able to resolve these differences if Munitions Board can not.

By March, the Controlled Materials Plan (CMP) should be in operation, so materials for every airline and military plane are to be scheduled for manufacture and delivery. To do the scheduling for CMP, the Munitions Board Aircraft Division is setting up civil representation at Wright Field on the scheduling unit called the Aircraft Production Resources Agency—APRA. APRA will schedule priorities and materials by item as did the scheduling unit of World War II.

▶ **Civil DO Priorities**—CAA was the first civil agency that the National Production Authority authorized to issue defense priority ratings. CAA stamps DO orders on essential civil aircraft requirements and on its own federal airways system requirements for avionics and other navigation and airport needs. CAA also can issue DO orders for research and development programs, some of which are joint ventures with the military and some exclusively civil projects.

▶ **How To Get Priority**—The government procedure for processing airline and other claims for DO ratings on materials and new planes are:

• **Airplane owner** files with his claimant agency. (U. S. scheduled airlines route their requests through the Air Transport Assn.) Claimant agencies are: CAA for all U.S. aircraft spare parts; CAB for all U.S. requests for new aircraft; ECA for all ECA nations; and Office of International Trade for foreign nations outside the ECA group. (Department of State collects and presents the ECA and OIT requirements.) Aircraft owner submits his requirements, broken down by dollar value and item in various categories. The list should outline expected requirements over the next two years, by months.

• **Claimant agency** screens the priority requests. For instance, if an airline asks double the value of engine spares per month that CAA records show it used per plane in the past, CAA will ask the airline to explain the jump in parts procurement.

• **CAA staff collects** all the claimant schedules, and consolidates them with its own. G. R. Gaillard at CAA is setting up the staff to do this now. Gaillard will then forward the schedule of essential civil requirements to the Air Coordinating Committee.

• **ACC is setting up** an Aircraft Claimant Division, composed of all the claimant agencies, under the chairmanship of a National Production Authority man. Who that will be is not certain. It is likely it would be the chief of the NPA Aircraft Section of the Transportation Division. All departments and agencies having a major interest in Claimant Division activities will be permitted to participate on those matters of substantial interest to them. This means that the Munitions Board will be represented, as well as the claimants, the State Department, NPA, DPA, and so on.

This group again screens the claims, having in mind the total estimated sup-

ply of materials and assembly line space available. Thus, if an ECA nation airline asks more parts per plane than seems normal, ACC checks on the requirement. Later, if there is an overall limit on availability, ACC may try to scale down all demands to fit supply.

Then the ACC transmits its conclusions and recommendations to the National Production Authority for NPA guidance in authorizing defense orders or directives necessary to carry out the program.

According to the ACC plan, the "NPA will initiate such necessary delegations or actions with policy memoranda to the Department of Defense (Munitions Board) as may be necessary to assure the availability of production resources and materials to support the approved requirements. The NPA had taken no position on this recommendation up to last week.

• **NPA role** then is to reconcile aircraft needs with possible conflicts of short supply in the rest of the civilian and military economy. ACC would take over most of the NPA aircraft operation. At the time of this writing, aviation is still represented at NPA by an "Aircraft Section" under the "Transportation Equipment Division." NPA has 22 industry divisions. NPA aircraft section chief is Albert Matthews of AiResearch Co. His immediate boss in the NPA Transportation Equipment Division is Robert L. Glenn, who comes to NPA from the NSRB, WPB and other government agencies and before that was editor of the Brotherhood of Locomotive Firemen and Enginemen magazine.

The authority's newly named top administrator is Manley Fleischman, a New York lawyer who was with WPB in World War II. NPA assistant administrator, who originally set up the NPA office and much of the staff, is H. B. McCoy, of Commerce Dept.

NPA, after screening the aircraft materials requirements, shoots then on to the Munitions Board Aircraft Division, under Myron A. Tracy.

• **Munitions Board,** acting "under such delegated authority as NPA may issue, shall integrate the approved civil program with the military program and handle the necessary administration and operation incident to claiming of materials for and execution of the entire aircraft production program through its established organization. This action shall include making appropriate provision for civil aircraft in the 'aircraft preference list'."

According to the ACC plan, claimant agencies would have membership on the Munitions Board Aircraft Committee and Aircraft Resources Production Agency (formerly the aircraft scheduling unit) at Wright AFB. Civil representation on the Munitions Board scheduling operation should be arranged within one month.

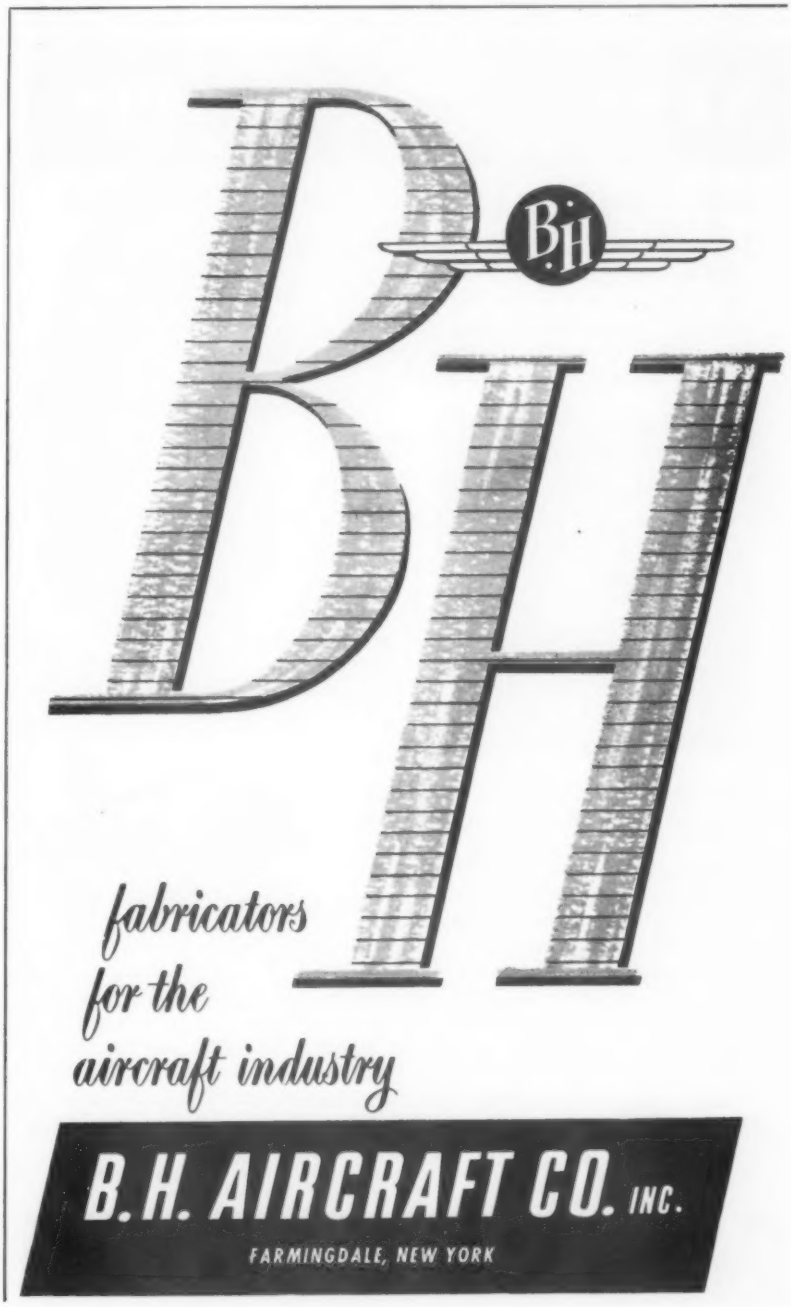
• **Unresolved arguments** on the Munitions Board groups would be referred back to the ACC for recommendation to the NPA.

• **CAA issues the DO** order that gives the final OK with military on essential civil aircraft and spare parts orders to warehouse or manufacturer.

▶ **Agency Shakeup Seen**—Recommendations of the Air Coordinating Committee have been months in preparation, as it takes time to get approval from the many agency chiefs who have fingers in the defense pie.

But many industry observers expect to see Charles E. Wilson revamp the NPA setup for aviation. These observers say that as defense orders increase, it may become impossible for the aircraft section of NPA to do its job under its present limitations. As it is now, the aircraft section of NPA is just another small sub-agency designed to care for a small segment of the U. S. transportation economy. But when aircraft production bottlenecks become of vital importance to the nation, observers say they will need something like the Aircraft Production Board of World War II.

Defense mobilizer Wilson may imply



big changes in the aviation production planning when he says: "Obviously, as the program accelerates and broadens, consideration will have to be given to further changes."

Right now there are at least three different government agencies planning the role of civil air transport and private flying in mobilization and war. These are the new Defense Production Administration, the NSRB, and the Post Office.

Defense Production Administration was set up over NPA by Defense Mobilizer Wilson to "provide coordination and direction to the production phase" of the defense program. This is headed by William Henry Harrison, former president of International Telephone and Telegraph.

The role of DPA is described by Wilson as follows: ". . . the National Production Authority of the Commerce Department has heretofore had both programming and administrative powers over industrial priorities and allocations. These powers are now transferred to the Defense Production Administration, but the actual issuance of orders after approval by DPA, etc., will be continued by NPA."

Washington aviation observers are worried about how civil aviation will fare at the hands of this Defense Production Administration. The role of civil aviation will be considered by DPA's Transportation Policy Council, under its chairman, General Philip B. Fleming of the Commerce Dept. Representing aviation on this committee is CAB Chairman Delos Rentzel.

The DPA Requirements and Allocations Advisory Committee will recommend to Harrison on how much materials civil aviation should get.

Meanwhile another group, under NSRB, is also studying the role of civil aviation in mobilization. This is the Industry Task Group under the chairmanship of Delos Rentzel. It will report to the President and others by Mar. 15 at the earliest. And the aircraft branch of NSRB is preparing recommendations on production allocations.

The Post Office is working on a transportation survey of its own. Among other things, it is studying possibilities of getting a trunkline airmail system, using a real airfreighter plane, that would be competitive with rail in cost as well as service.

The ACC proposal looks more complex than it is. Reason: The ACC plan is using present channels and agencies available. But the idea is to get the Air Force, Navy, Army claimant agencies on its ACC Claimants Division, under an NPA chairman.

► **NPA Electronics Division**—Another thing not yet clear is the place of the Electronics Products Division of NPA. This is headed by J. D. Dailey, retired New England Telephone Co. man. Under Dailey is Donald Parris, who came from Commerce Department and set up Electronics Products Division.

► **Light Metals Division**—For weeks, an order forbidding further manufacture of some 300 non-essential aluminum products has been on the desk of acting director of NPA Light Metals Division Nigel H. Bell. Issuance of the NPA order was expected momentarily last week, due to the growing pressure of aluminum shortages.

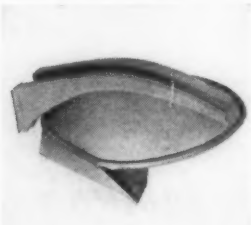
NEWS Edo NOTES

EDO FLOATS SPEED LOUISIANA OIL PRODUCTION

The utility of seaplanes to expedite industrial operations has seldom been demonstrated more conclusively than by the activity which has sprung up around New Orleans and the Delta area. Here a fleet of over 30 seaplanes shuttles daily among the oil wells which have been drilled in isolated bayou country previously reached only over rough country roads or by boat.

Now many different firms serving the oil industry use their planes on Edo floats to make in minutes the same trips which used to take a whole day. Engineers, supervisors, service personnel and many others have learned to fly and use company planes in a matter-of-fact manner proving the growing importance of civil aircraft to the efficient operation of modern business.

Edo's extensive experience in building all-metal floats is now engaged in many other metal-working projects. Typical of this type of precision manufacturing is the reflector shown at the right, made for Raytheon shipboard radar equipment.



EDO ODDITIES. Edo's Electronics Division has developed a new high-powered sonar equipment for the U. S. Navy which has already been put to unique use in Chicago harbor. To make way for construction of a new filtration plant, a 5 mile tunnel must be dug in bed rock buried below an irregular thickness of mud and silt. To locate the top level of the bed rock, Edo sonar equipment was used instead of test borings, with quick, accurate results.

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CCA Air Coach

West Coast intrastate carrier shows low-cost passenger service pays.

By Thomas M. Self

California Central Airlines—the yeast in the West Coast air coach pudding—has just closed out two years of operations with a total of over 56 million passenger miles flown. To do it, CCA had to buck first the opposition, then the competition of the big operators.

CCA began operations in January 1949. In July 1949, Western Air Lines hit at "unscrupulous" cut-rate carriers. But a month later, Western Air Lines of California, using planes leased from WAL, and WAL crews, maintenance and facilities, was flying coach operations between Los Angeles and San Francisco.

In April 1950, United Air Lines ended a long period of sniffing at "uneconomic" air coach by jumping into the Los Angeles-San Francisco picture.

▶**In the Black**—Despite this competition and the entry of other uncertificated intrastate carriers in the field, CCA has stayed in the black, except for its first month of operation. In 1950 it flew 93,645 passengers, an increase of 10,558 over 1949.

The successful intrastate carrier now operates a total of 28 flights daily between Los Angeles-Burbank and San Francisco-Oakland and San Diego, with up to 40 flights on weekends. Col. C. C. Sherman, president, says the airline will continue expansion during 1951, offering low-cost scheduled service to California cities now landbound.

Next station will be Fresno, in the heart of California's rich central valley. Fresno citizens are clamoring for coach service, Sherman says, and they are unhappy about paying $14 to $15 to scheduled airlines for a flight to Los Angeles when the same carriers charge only $10 for the longer San Francisco-Los Angeles run. Sherman expects to serve Fresno from Los Angeles for considerably under $10.

Sherman would like to serve a couple of other juicy high-density runs now ignored by big operators, but they involve crossing state lines and so he'll have to wait for certification.

California Central has just inaugurated the first low-cost commuter service during business hours from Los Angeles International Airport. During the recent holiday season CCA flew 3847 passengers in 8 days, from Dec. 21 to Dec. 29. Record day was Dec. 22 with 807.

In the last two years Sherman has proved that it is just as profitable to fly a full load at 3.1-cents-a-mile coach fares as it is to fly half a load at double that fare—not to mention the added service to the public.

▶**Beating the Big Boys**—The story of the successful intrastate carrier is a story of fortitude and foresight. California Central Airlines has been pressured directly or indirectly by the big operators from the day it made its first flight. But it has weathered the storm and built a sturdy organization—without subsidies—as well as making the big fellows eat their words on air coach and scramble to get into the act.

CCA flew its first schedule between Los Angeles (Burbank) and San Fran-

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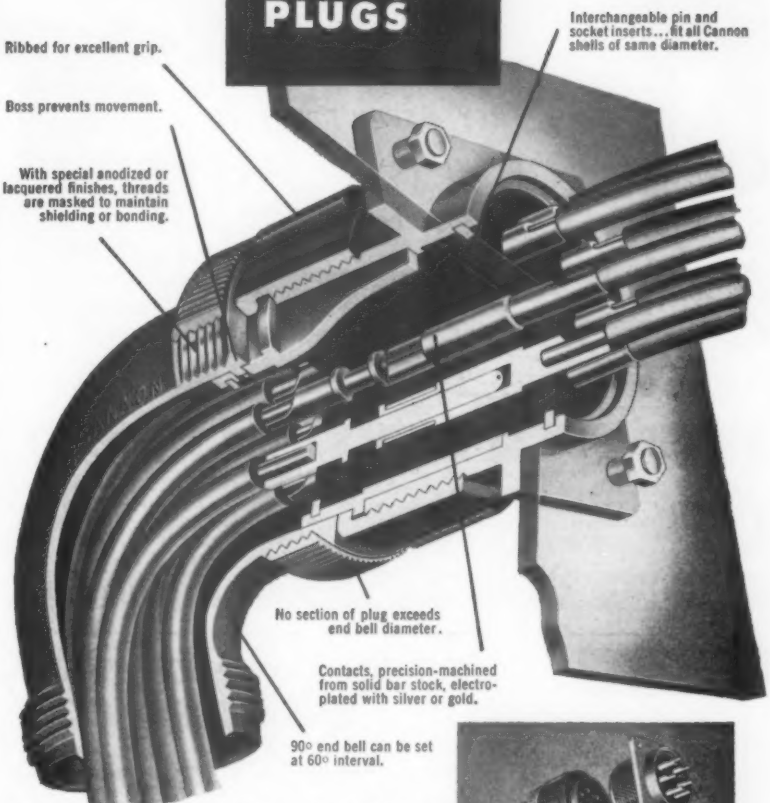
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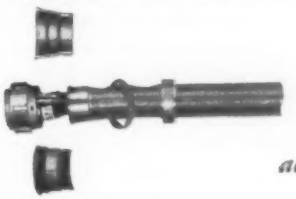

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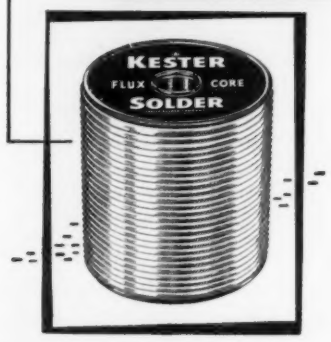

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cisco Jan. 2, 1949. CCA was organized in April, 1947, and Sherman used the time intervening to set up an organization and survey routes for a scheduled operation. Before that, Airline Transport Carriers, Inc. had flown as a non-scheduled operation, the first in the West.

Sherman would have preferred to wait longer before starting scheduled operations. But in December 1948, in his words, "CAB classed all nonscheduled operators as fly-by-nights and cut flights to eight a month—so that a non-scheduled operator couldn't meet expenses. We weren't interested in violating these regulations. And our organization by then was too big for just eight flights. So we had to set up immediately as an intrastate carrier."

Airline Transport Carriers, Inc. was trimmed to just enough flights to meet regulations and keep its identity. All efforts were concentrated on the single high-density scheduled operation between Los Angeles and San Francisco.

Traffic soon justified the venture. In a month CCA was operating a morning, afternoon and evening flight each way. In five weeks a fourth afternoon run was added. In two months CCA operated six flights each way, and this soon was increased to a total of 12 flights each way. This schedule was trimmed somewhat when Western and United and others got into the act, but the carrier's present 28 flights are a good indication of its health.

► **Economically Feasible?**—Schedules were flown for just a week, however, when pressure on the California Public Utilities Commission forced a special investigation of CCA to determine the economic feasibility of its operations. The investigation dragged on for nine months. At the hearings, Sherman says, Western Air Lines argued that coach travel was out of the question, that people couldn't be carried economically for 3.1 cents a mile. Sherman notes that WAL turned around eight months later and inaugurated its own coach service through Western Air Lines of California, and today boasts about its profitable coach service.

The investigation vindicated CCA. The California PUC held it was economically feasible to operate at coach fares. The Civil Aeronautics Board accepted the PUC findings, though it didn't see fit to issue a certificate to the carrier.

California Central's first load factor was 100 percent. Since then it has averaged 81 percent or higher on the San Francisco-Burbank runs. CCA moved into Sacramento but lost money and pulled out. Sacramento air traffic is good only when the legislature is in session. Then the carrier added Oakland and San Diego to its runs. Traffic on the San Diego run has built up slowly

but consistently and now has about 60 percent load factor.

▶**L. A. Landing Rights**—The carrier has just been given permission to land at Los Angeles International Airport. It asked permission to land at the field over a year and a half ago, but was put off with explanations like "We'll let you in if there's room, but we can't allow you in on regular schedule because traffic is already too heavy."

In its typical scrappy fashion CCA took pictures to prove there was room, then appealed to the interim committee on public utilities. Thereupon the airport invited CCA to the table.

Sherman expects the Los Angeles base will increase traffic 50 percent out of the Los Angeles area and another 25 percent out of the San Francisco-Oakland area.

In August 1949, California Central got its major competition on the Los Angeles-San Francisco run when Western Air Lines of California started operation. CCA's traffic dropped 20 to 23 percent, according to Sherman, but it soon snapped back.

When United Air Lines was given permission in April 1950 to operate coach service on the Los Angeles-San Francisco run, CCA's load factors were again cut at first, but they again soon snapped back.

Now Sherman thinks Western and United are actually helping CCA's load factors by generating more business on the L.A.-S.F. run with their Convair-Liners and DC-6s.

In October, ordinarily a bad month, CCA carried over 10,000 passengers. Load factors were a healthy 83 percent.

▶**What It Takes**—Sherman attributes the success of California Central to two things—performance of a needed service with an eye to passenger comfort and strict adherence to schedules, and a hard-working, loyal staff. (Everybody works hard at CCA because they believe in it.)

The Los Angeles to San Francisco run was ripe for dependable low-cost air service, and Sherman's organization stepped in to fill that need. Sherman gives this analysis of traffic sources: 33.5 percent are seasoned air travelers, practically commuters; 30.5 percent are converted from autos; 18.7 percent from the railroads; 4.5 percent from buses; and 12.8 percent miscellaneous.

Though not certificated, CCA operates under the same Civil Aeronautics Administration regulations as certificated carriers, pays strict attention to safety factors. The carrier adheres to Parts 40 and 61 of CAA maintenance regulations, under the eye of CAA inspectors. Flight operations also are under CAA-designated flight inspectors. California Central has a perfect safety record, but being non-certificated has

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Schedule keeping and passenger comfort are paramount at CCA. The CCA staff breaks its neck to get passengers off on schedule. Sherman believes it is far more important to get off on time than to land on time. He says passengers board a plane with a bad taste in their mouth if takeoff is delayed, even though the pilot makes it up in flight. On the other hand, passengers understand if they land a bit late.

But CCA invariably makes its landings on schedule, too. Pilots know just where to let down to make the skeds. They're highly rated by control tower operators. Constant attention is given to improving schedules. Even a two-minute saving in block time is important to CCA. DC-3 time between Burbank and San Francisco is 2 hr. 10 min.; and half the flights make it in 1 hr. 55 min. The carrier's DC-4 on loan to the Korean airlift broke the record on its second flight, 68 hr. 23 min. for the roundtrip to Japan.

Equipment operated is eight DC-3s and two DC-4s. All are de luxe jobs inside. Two stewardesses are assigned to the DC-4s and one to the DC-3s. Snacks are served on every flight.

The DC-3s are 28-passenger ships with drop doors. CCA gets extra room for seats by eliminating the coat rack and cutting 6 inches off the lavatory compartment. Coats are folded and put in the rack over the seats.

► **Radio Service**—Passengers can use CCA's radio service. If a passenger has forgotten some business before leaving the airport, CCA's pilots will call the base and relay the message. These services may seem unimportant, but Sherman says they build business. Though, of course, strict schedule keeping is the main booster for CCA.

At present CCA has 194 employes and a respectable headquarters building at Lockheed Air Terminal. The airline has hauled over 175,000 passengers.

In spite of this success in intrastate operation, Sherman is anxious to get the CAB certificate he applied for over two years ago. First, there are the other routes he'd like to service. Also he'd like to get on the other side of the fence so the big carriers will stop throwing curves at him.

Sherman would also like an opportunity to carry the mail for the cost of the service. He is a firm believer in separation of mail pay and subsidy so that people get fast mail service but pay only for the service. He believes

subsidies to airlines are justified on runs to "one-horse" towns, but not on traffic to big business centers. He thinks any carrier that is qualified should be permitted to carry the mail.

California Central has what is probably the only husband-wife team in the business. Mrs. Edna K. Sherman is secretary-treasurer of the company.

ICAO Study Lists Civil Jet Problems

With the application of turbine power to civil aircraft, the designers may have to reduce landing speeds. Airport layout and equipment modifications are also in order. These are effects of operational characteristics of turbine-powered civil planes as seen in a study by the Air Navigation Bureau of International Civil Aviation Organization.

Some of the major conclusions by ICAO are:

• **Runway length** may not have to be increased appreciably, at sea level. But so far no way has been found to slow down a landing pure-jet airliner as rapidly as conventional airliners.

• **Landing run** appears to be the most doubtful factor in forecasting runway length requirements of the future. If wing loadings of turbojet airliners are the same as present types, then tail parachutes or reversible Rato units would be needed to keep the landing run in bounds. But these are expensive and impractical for airline operation. And reversible jet engines are thought impossible for a long time to come.

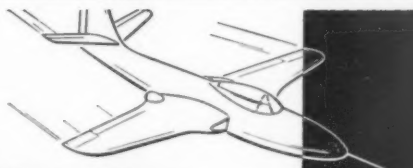
Thus it may be that aircraft designers will have to provide lower wing loadings or special airfoil flaps and slots to allow a slower landing approach than the typical conventional transport of today has.

• **Takeoff run** of turbine-powered airliners at sea level may be about the same as comparable conventional craft of today, under standard conditions. This is because they have to fly higher, and their climb performances must allow adequate margins for high-altitude performance.

But under adverse conditions of temperature accountability a plane of 100,000-150,000 lb. gross weight might need up to 50 percent more runway length than under standard conditions.

The British Comet operates well out of a 6500-ft. effective runway under standard conditions, but takeoff at altitude in tropical conditions is a problem.

This might be offset to some extent, however, by use of water/methanol injections. Also, under exceptionally bad temperature-pressure conditions, airlines



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Thus airports will have to provide for faster taxi speeds to offset some of the loss. Or perhaps auxiliary power may have to be supplied to the aircraft in some way.

• **Fuel requirements** are greater on turbine planes, so tanker capacity may have to be increased, or more hydrants installed.

Cockpit Uniformity Standards Issued

Airline cockpit standardization plans became a reality when amendments to Part 4B of Civil Air Regulations became effective last week for all new plane designs. And cockpit standardization plans for existing airline planes came a step nearer completion with the conclusion last week of the Society of Automotive Engineers Committee S-7 meeting which is wrestling with the problem of just what standard should be adopted for the existing T-category planes

By next January, all existing transports except the DC-3 and Lodestar must conform to a standard as yet undetermined. CAB Chairman Delos Rentzel and Technical Safety Assistant Robert V. Garrett promise CAB will issue further regulations that standardize the cockpits of existing planes by one year from now and control knob shape and color requirements 1½ years from now.

Chief reason for pushing standard cockpit now is the military airlift on which airline pilots fly planes of other airlines. Standardization has been in the cards ever since interchange agreements started catching on.

UAL DC-6s to Get Low Tension Ignition

United Air Lines is going to spend $750,000 equipping its entire fleet of 44 DC-6s with low tension ignition systems (AVIATION WEEK Aug. 7, 1950).

The low tension system, a product of Scintilla Magneto div., Bendix Aviation Corp., Sidney, N. Y., will be installed on 334 Pratt & Whitney R-2800 engines. Conversion will start in April and should be complete in October, the airline says.

The Bendix-Scintilla ignition system will also be mounted on the 20 new DC-6Bs United will be receiving, starting next month.

SHORTLINES

▶**American Airlines**—President C. R. Smith forecasts "an even greater increase in business in 1951" than in 1950. The 1950 passenger mile record of 1,789,185,167 was up 14 percent from the year before. . . . Company takes delivery on 14 Douglas DC-6Bs at cost of $16,500,000 this year. No new financing will be required. . . . Average load factor 1950 was 70 percent, compared to 65 percent in 1949. . . . Estimated mail ton miles increased 11 percent, express 31 percent, and freight 12 percent.

▶**British European Airways**—Carrier figures employe productivity increased 25 percent in 1950. Here is how it was done: capacity ton miles carried Apr.-Oct. 1950 were up 34 percent over 1949 to 36,705,800; number of employes was up 7 percent to 6937; thus productivity was up 25 percent to 9024 ton miles per man. BEA claims a profit for the seven months of 254,484 pounds, compared to a loss Apr.-Oct., 1949, of 162,438 pounds.

▶**Canadian Pacific Airlines**—Carrier says weather had nothing to do with the recent fatal DC-3 crash in the Canadian Rockies. Actual cause is still unknown.

▶**Capital Airlines**—Company's operating profit in November was $49,153 and net profit $20,264 on operating revenue of $2,612,585. Especially bad weather cost the company an estimated $15,000 revenues that month.

▶**Delta Air Lines**—Company expects an even better year in 1951 than 1950. Estimated 1950 net profit was $1,100,000 or $2.20 a share, operating profit $2,050,000. . . . Passenger volume increased 21 percent, revenue miles 33 percent, air mail 24 percent, express 43 percent and freight 63 percent over the previous year.

▶**KLM Royal Dutch Airlines**—Company has a new sea-air agreement with Alcoa steamship lines. Traveler gets roundtrip, one way by air and other by sea. The traveler is permitted to ship his heavy luggage and baggage both ways on his combination ticket.

▶**Pan American World Airways**—Carrier is operating three roundtrips a week on its newly opened Paris-Rome service, and extension of the New York-Paris service, opened Dec. 17, 1950. New York-Rome fares range upwards from the tourist roundtrip at $532. Stratocruiser seating density has been cut to 47 passengers. . . . Estimated 1950 traffic of PanAm comes to 14,122,000 passenger miles. . . . Carrier's

ENGINEERS

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1950 records include over one million passengers and fifty million cargo pounds hauled on ordinary runs, while military airlift operation by PanAm carried 17,424 troops and 4,054,763 pounds cargo to Korea.

► **Resort Airlines**—Tour airline has an agreement with Nationwide Air Transport Services, large irregular carrier, to acquire the latter's assets. Resort plans to issue 2 million shares of stock to holders of Nationwide. Resort would then have 9 Commandos, 3 DC-4s and 3 DC-3s. . . . Carrier has acceded to a CAB cease and desist order forbidding certain alleged violations of certificated authority.

► **Robinson Airlines**—Feeder has show-cause order from CAB setting temporary mail rate at 50 cents times ratio of scheduled miles flown during the month to the designated miles flown during the month. Rate is effective Sept. 1, 1950. But, says the Board in a footnote, this "should not be construed as an indication that Robinson's certificate will or will not be renewed" after expiration June 28 of this year.

► **Sabena Belgian Airlines**—Company says it ordered on Dec. 20 two more Convair-Liners to bring its Convair fleet of eight (all operating in Europe). But Consolidated Vultee says no such order has been placed, or at least completed.

► **Seaboard & Western Airlines**—International cargo carrier has leased a one-story warehouse of 5000 sq. ft. at 155-57 Attorney St., New York, and has switched freight receiving there from its former location.

► **Slick Airways**—Cargo carrier gave Christmas bonus of 5 percent to employes of over two years' service, less to later employes. . . . Company hauled over 5 million ton miles freight in November.

► **Trans-Canada Air Lines**—Company carried 820,000 passengers in 1950, an increase of 19 percent. Cargo ton miles totaled 4,800,000. . . . The Canadian airline continued carriage of first-class mail bearing only standard postage; this volume was up to over 4 million ton miles. Trans-Canada flew 98 percent of its scheduled mileage in the year over its network of 17,000 miles.

► **Trans World Airlines**—Carrier's new de luxe "Ambassador" flights to London and Paris carry a surcharge of $10, which brings luxuries of limited passenger capacity, full-course dinner, cocktails and champagne.

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Of current importance is a revision of the 1946 edition of the **American Standard Abbreviations for Use on Drawings.** Collaboration with the National Military Establishment's standardizing agency was maintained during the revision of this publication. It is available at $1.00 per copy from American Standards Assn., Inc., 70 E. 45 St., New York 17.

The Aviation Market for Cleaning Compounds is a comprehensive survey of the cleaning compounds field by AVIATION WEEK Researcher A. F. Scaffo, covering the market, description of compounds, where they are used, who makes them and who buys them. Write AVIATION WEEK, McGraw-Hill Publishing Co., Inc., 330 W. 42 St., New York 18, care of A. F. Scaffo.

Telling the Market

A new reference manual containing complete specifications on close to 100 different eutectic low temperature welding alloys comes in a handy **six-page folder** opening to an 11 in. x 23 in. wall chart. It is available free from Eutectic Welding Alloys Corp., 40 Worth St., New York 13. . . . New Departure **ball bearing catalog,** in its 20th edition, offers engineers comprehensive data to aid in selection of bearings by type and size, load and speed. Write New Departure, division of General Motors Corp., Bristol, Conn. . . . Reference and instruction book, **Welding with Ampco Bronze Electrodes** covers every bronze electrode made by the concern, plus information on recommended techniques, procedures and machining. Available from Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46.

New Quarters

Bell Aircraft Corp. has opened a Washington, D. C., office in Suite 510, Realty Building, 1424 K St., N.W. The new office will be in charge of G. B. (Jerry) Clark.

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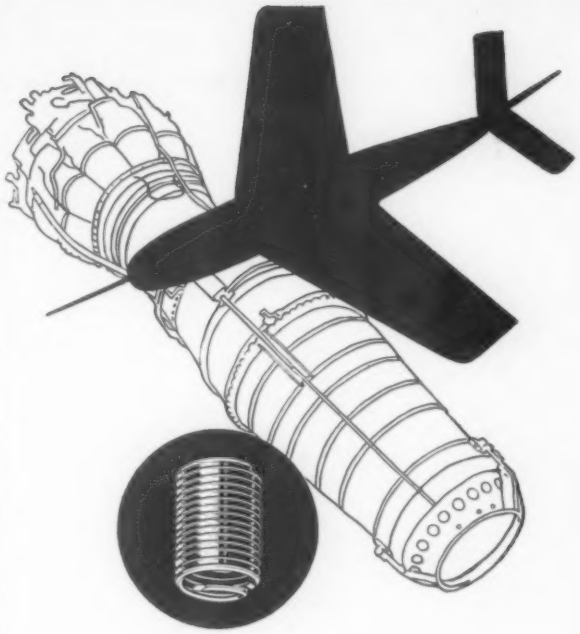

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LETTERS

What Is Skill?

I was particularly interested in your article on shortage of aircraft labor in your Nov. 20 issue.

May I relate a personal experience? If this is in print, you may receive letters from others who have had similar experiences.

The small airport where I have been manager the past four years is closing. So, with aircraft manufacturing being considerably increased, I decided to take stock of my aviation background, then see with whom I might be of service.

I am 36, married, in good health, honorably discharged from USMC aviation, have A&E license, 16 years in all phases of aviation mechanics, ie. overhaul, hydraulics, rigging, assembling, maintenance, checks, trouble-shooting, shop and line supervision on planes ranging from 40-hp. Taylorcrafts to Consolidated B-24s. Received flight training after leaving service and in four and one-half years flew 1700 hrs. Have commercial single-engine land and multi-engine land, flight instructor, instrument, radio operator permit and am flight examiner, all valid CAA and FCC ratings, as well as having operated an airport.

Armed with this I thought surely someone could use a man with these qualifications.

The widely separated aircraft factories are quite some distance from this midwestern town so I decided to write to those more distant, about mid-October

My replies (from those that answered) were to the effect: "Fill out these application forms and we will let you know if there is a place where we can use you". To date I have heard nothing from them. One seemed to be a mimeographed rejection slip, to wit: my "experience did not meet with our demands" period.

I applied for any type of flying or non-flying job that I was qualified to do, preferring the former.

Then a friend of mine (who has nine years' aircraft experience, 1½ years' factory, is a veteran of naval aviation, and since the war has rebuilt and sold his own planes) and I decided to pay a personal call on those factories in central U. S. Taking time off from our work we made a 2000-mile flying tour in a Stinson Voyager and contacted most of the factories.

We sought employment through their regular agencies. The best job offered was $1.25 for general-assembly (and this would not even keep the A&E license valid); I was turned down once because "with my experience they did not think I would take the job they had to offer"; one agent tried to pin me down to the exact work I wanted, other than flying, but my not being familiar with the titles of the different positions, I could not name a type of job where they could use me nor was any help offered; another tried to pin me down on salary, and my answer—"the customary pay for that work"—was not satisfactory (after all, I was not sure what salary those jobs called for and though I did not expect to get rich, neither did I intend to give my experience away); one agent told me there would never be a chance of flying there, that he had twice my flying time and couldn't (and, me thinks, he wasn't going to let any one get ahead of him either); his other job opening was to "buck" rivets, salary $1.09 per hour; I was told there were no openings in any departments such as flight line or test as the old time employes had those, did not leave, and there was a line waiting for any vacancies.

So we came home, somewhat disillusioned, not knowing just what the factories called "skill" or "experience." We also wondered if the factory authorities knew this went on. We felt sure that someone could use this experience to its full extent. We felt we were not out of line in expecting a job and pay that was in line with our experience and qualifications. There is considerable time, work, and study involved in getting these ratings (try it some time while also holding a full-time job and keeping a happy home-life, if married).

I may add further that there are literally thousands of ex-service mechanics in the country who have had up to four and five years of extensive aircraft experience who would be available for factory work if called on and a job and pay offered commensurate with their ability.

So in connection with your article I ask you, in the vernacular, what gives?

Here at home my friend is at present working as a carpenter (a job for which he is not qualified) at $1.50 an hour. Think I'll join him.

Fred Minden
Box #409
Washington, Iowa

Ski Prescription

In reference to Industry Observer column Dec. 4, reporting Canadian efforts to improve skis, suggest using Westinghouse Micarta on aircraft skis to prevent both sliding resistance and adhesion. Since water lubricates Micarta, results should be satisfactory.

Joseph A. Boothrovd, Jr.
Westinghouse Electric Corp.
Aviation Gas Turbine div.
Lester P. O., Pa.

What Plesman Meant

Your editorial, "Why Sneer at Air Freight?" quoted the speech our president, Dr. A. Plesman, made at the IATA meeting at San Francisco.

You paid special attention to his remark concerning air freight and concluded wrongly that Dr. Plesman was inclined to neglect air freight or anyway thought it not worthwhile to pay full attention to its further development.

Your conclusion seems to be based on his remark: "I am also of the opinion that some attention must be paid to the development of air freight transportation."

Dr. Plesman meant, however, to say that he also is convinced that MORE attention has to be paid to this very important branch of civil aviation.

To avoid unpleasant misunderstandings, we thought it advisable to bring this to your knowledge.

R. J. Vogels, Manager
Public Relations Dept.
KLM, Royal Dutch Airlines
Badhuisweg 260
The Hague

From Boeing

VERY MUCH APPRECIATE NICE PLAY ON KC-97 AND EXCELLENT HANDLING SUBCONTRACTING STORY JAN. 1 ISSUE AVIATION WEEK.

Harold Mansfield
Director of Public Relations
and Advertising
Boeing Airplane Co.
Seattle

Real Growth

This is in regard to your article, "Sao Paulo's Busy Congonhas Airport," Oct. 23.

The 14 airlines regularly serving Sao Paulo are really only 13 since Real took over Natal Airlines more than a year ago. There is no such thing as Natal Airlines anymore since all their airplanes are flying under Real's flag and colors. The same thing goes for Management, Operations and Maintenance.

That brings some significant changes on the January-June 1950 figures of Congonhas Airport. Real leads the list of flights, passengers carried, baggage and mail.

All this is very significant: Starting with two DC-3s four years ago our airline is now at a leading position at one of the world's busiest airports. We are operating now 24 DC-3s and will start operation next month with two C-46s.

Eng. Eduardo M. Alvarenga, Director
de Maintanceo
Real S/A
379
Sao Paulo, Brazil

From Airborne Lab

Aviation Week with its article on "OBD —Its Errors, Coverage, Reliability" has just arrived.

We are pleased with the detailed presentation of this technical material and congratulate Mr. Anderton on the manner in which he has so skillfully handled it. The members of the Laboratory Staff who participated in this project completed a thorough and painstaking task and we feel justifiably proud of them.

Hector R. Skifter, President
Airborne Instruments Laboratory
160 Old Country Road
Mineola, N. Y.